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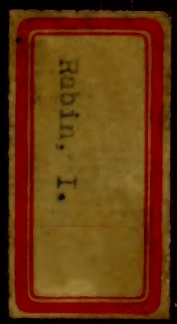

BOSTON UNIVERSITY

GRADUATE SCHOOL

Dissertation

PERSEVERATION IN DEMENTIA PRAECOX AND MANIC DEPRESSIVE PSYCHOSES

by

Israel Rabin

(B.S.in Ed., Boston University, 1935; A.M., Boston University, 1936)

submitted in partial fulfilment of the

requirements for the degree of

Doctor of Philosophy

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TABLE OF CONTENTS

	Page
INTRODUCTION	1
I. THE NATURE OF PERSEVERATION	3
A. Perseveration in everyday life	3
B. Historical sources concerning perseveration . . .	3
C. Perseveration and Physiology	10
D. Perseveration in Psychiatry	13
II. GENERAL EXPERIMENTATION ON PERSEVERATION	16
A. The Dutch School	16
B. The English School	19
C. Experimental Work in the United States	24
D. Summary of Experimental Methods	28
E. Some Theoretical Considerations	30
III. EXPERIMENTATION WITH PSYCHOTIC MATERIAL	32
A. Perseveration correlated with the various diagnoses (Psychiatric)	32
B. Points of Disagreement	42
C. Aim of Present Study	45
IV. EXPERIMENTAL METHODS AND PROCEDURE	47
A. Subjects used	47
B. The Preliminary rapport	48
C. Tests employed in Study	50
1. Motor Tests	50

TABLE OF CONTENTS

Page

INTRODUCTION 1

I. THE NATURE OF PERSEVERATION 3

A. Perseveration in everyday life 3

B. Historical sources concerning perseveration . . . 5

C. Perseveration and Physiology 10

D. Perseveration in Psychiatry 13

II. GENERAL REVIEW OF PERSEVERATION 18

A. The Dutch School 18

B. The English School 19

C. Experimental Work in the United States 24

D. Summary of Experimental Methods 28

E. Some Theoretical Considerations 30

III. EXPERIMENTATION WITH PSYCHOTIC MATERIAL 32

A. Perseveration correlated with the various diseases (Psychiatric) 32

B. Points of Disagreement 42

C. Aim of Present Study 45

IV. EXPERIMENTAL METHODS AND PROCEDURE 47

A. Subjects used 47

B. The Preliminary Report 48

C. Tests employed in Study 50

1. Motor Tests 50

Page

a. Reverse Stroke (Z) 51

b. Stroke test 54

2. Sensory Tests 54

a. Light adaptation 56

b. Electrical sensitivity threshold . . . 57

3. A Test of Rhythmic perseveration 57

D. Critique on Subjects' Reports (Reliability) . . 60

E. Methods of Scoring 61

V. EXPERIMENTAL RESULTS 65

A. Preliminary Results 65

B. Further Results 68

C. The Test on Rhythmic Perseveration 77

VI. DISCUSSION OF RESULTS 79

A. Diagnoses and P-Scores 79

B. Intercorrelation between the Tests 81

C. Relation between Age and Perseveration . . . 82

D. "Improvement" and P-scores 83

E. Theoretical Considerations 84

VII. CONCLUSIONS 86

A. On the Future 87

BIBLIOGRAPHY 89

Page

e. Reverse Stroke (2) 51

f. Stroke test 54

2. Sensory Tests 54

a. Light adaptation 56

b. Electrical sensitivity threshold 57

3. A Test of Rhythmic perseveration 57

D. Critique on Subjects' Reports (Reliability) . . 60

E. Methods of Scoring 61

V. EXPERIMENTAL RESULTS 65

A. Preliminary Results 65

B. Further Results 68

C. The Test on Rhythmic Perseveration 77

VI. DISCUSSION OF RESULTS 83

A. Diagnoses and P-Scores 72

B. Intercorrelation between the Tests 81

C. Relation between Age and Perseveration . . . 83

D. "Improvement" and P-scores 85

E. Theoretical Considerations 84

VII. CONCLUSIONS 90

A. In the Future 97

BIBLIOGRAPHY 99

LIST OF TABLES

		Page
I.	Sensory Perseveration in Normals and Psychotics (Wiersma)	33
II.	Jones' Results	33
III.	P-Scores for Psychotics and Normals (Stephenson) . .	37
IV.	Cattell's Results	40
V.	Shipley's Results	42
VI.	Mean P-Scores in Cases of Dementia Praecox and Manic Depressive	65
VII.	Preliminary Correlations of Tests with Age . . .	66
VIII.	Means of P-Scores for Dementia Praecox and Manic Depressive Cases	69
IX.	P-Scores of Catatonics and other Praecox cases . .	70
X.	P-Scores Comparing Catatonic and Paranoiacs . . .	71
XI.	P-Scores of Paranoiacs and "Others"	72
XII.	A Comparison between Mania and Depression in regard to Perseveration	74
XIII.	Correlations Between the Tests	75
XIV.	Test Scores for Younger Age Groups	76
XV.	Test Scores for Older Age Groups	76
XVI.	P-Scores of Improved Subjects	77
XVII.	P-Scores for High and Low Perseverators as Determined by the Test on Rhythmic Perseveration	78

LIST OF TABLES

Page

I. Sensory Hyperesthesia in Neurosis and Psychosis (Wittkower) 25

II. Jones' Results 35

III. P-Scores for Psychotics and Normals (Stephenson) . . 37

IV. Cattell's Results 40

V. Shipley's Results 42

VI. Mean P-Scores in Cases of Dementia Praecox and Manic Depressive 63

VII. Preliminary Correlations of Tests with Age . . . 66

VIII. Means of P-Scores for Dementia Praecox and Manic Depressive Cases 69

IX. P-Scores of Catatonics and other Praecox cases . . 70

X. P-Scores Comparing Catatonic and Paranoiacs . . . 71

XI. P-Scores of Paranoiacs and "Others" 72

XII. A Comparison between Manic and Depression in regard to Hyperesthesia 74

XIII. Correlations between the Tests 75

XIV. Test Scores for Younger Age Groups 76

XV. Test Scores for Older Age Groups 78

XVI. P-Scores of Improved Cases 77

XVII. P-Scores for High and Low Preferences as Determined by the Test in Nystagmic Hyperesthesia 78

List of Figures

Page

Figure 1. Record of the Z-Test 53

Figure 2. Record of the Stroke Test 55

Figure 3. Kymographic Record of the Test of Rhythmic Perseveration ("No Change" Patient) 59

Figure 4. Kymographic Record of the Test of Rhythmic Perseveration (A "Change" Patient) 59

List of Figures

Page

Figure 1. Record of the Z-Test 32

Figure 2. Record of the Stroke Test 33

Figure 3. Kymographic Record of the Test of Rhythmic Interaversion ("No Change" Patient) 39

Figure 4. Kymographic Record of the Test of Rhythmic Interaversion (A "Change" Patient) 39

Introduction

Since the end of the last century, when English psychologists (Galton and others) brought to the attention of the psychological world the problems of individual differences, much research has been done. Hundreds and, perhaps, thousands of articles, volumes, and monographs have been published on this subject. The quest for the discovery of laws which may, paradoxically enough, explain these individual differences was predominant.

Soon after the British beginning, American psychology took up the challenge and, headed by Cattell, attempted to get at the basic constituents of mind and the laws governing their variability and difference in degree among different individuals.

The new interest in the investigation of traits introduced a new elementism. For a while the traits as such, abstract as they were, were measured with little regard to their interrelationship with other traits and the total, concrete personality. More recently, however, psychology began to admit the error. It started to consider the measured trait within its context, in its psychological background, which is the unified personality. Thus, our analysis into traits is merely temporary; it presumes and anticipates a post-analytic synthesis.

Concurrent with the movement of individual differences, there arose, also, the new tendency to learn something about the normal personality from the study of psychopathological material (Freud, Gross, Jung, Adler and others). The extremes of behavior, as manifested in psychotics, hold, to some extent, the key to our understanding the behavior of the "normal" individual. The gap between the abnormal and the normal is bridged, it must be confessed, by a "process of logic." But, psychology, as it is at present, will have to resort to these devices, until our experimental

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The two tendencies mentioned above seem to be combined in the present study, which is a study of individual differences regarding perseveration in psychotic personalities. Much of the stimulus in this direction was given by Cameron who says that "Perseveration is a personality characteristic from the further study of which much is to be expected."[1] Moreover, he points towards psychiatry as being in need of research directed in that path, and says that "....there is a considerable need for further work in classifying the issues in connection with their function....it may lead to the elucidation of matters of considerable psychiatric importance."[2]

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[1] D.E.Cameron, Objective, Experimental Psychiatry, 70, 1935.
[2] Ibid, 73.

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[1] N.S. Cameron, Objective, Experimental Psychiatry, 70, 1944.
[2] Ibid, 72.

CHAPTER I.

THE NATURE OF PERSEVERATION

A. Perseveration in Everyday Life

Close and critical observation of everyday life will yield many bits of human behavior that can be classified under the general term of perseveration. To some extent, greater or lesser, it is a general property of all human behavior. And, as many other characteristics, it differs in extent and intensity with different individuals.

The difficulty in getting started at some task, the tendency to continue a certain activity once it is begun, the tune that "runs in the head," the difficulty caused by shifting from one activity or behavioral pattern to another, are all illustrative of what is meant by perseveration. To bring an analogy from physics---it is a sort of mental inertia which, presumably, is as much a property of mental energy, as physical inertia is of physical energy.

This inertia, "perseveration" or perseverative tendency, moreover, persists despite conscious efforts on the part of the individual to eliminate it and to rid himself of it.

B. Historical Sources Regarding Perseveration

Like psychology itself perseveration has a long past but a very short history.[1] Many investigators have presented summaries of the non-experimental literature concerning perseveration and have not only reviewed the psychological writings on the subject, but have also traced back the recognition of the phenomenon and its manifestations through the philosophical literature as far back as Plato.[2] Since this paper is not mainly

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concerned with the historical basis of the term and its philosophical genealogy, and since such broad historical excursions have not yielded new methods of attack upon the investigation of it, the present review will be confined to the psychiatric and psychological literature since the genesis and introduction of the term "perseveration" as such.

It was in 1894 that Neisser[3] applied the term "perseveration" for the first time, in describing the repetitious and continuous activities of certain mental patients. Muller and Pilzecker in connection with their experimental work upon memory observed the tendency of certain material to recur in consciousness spontaneously, without any conscious effort upon the part of the observers. This phenomenon was attributed to the certain "forces" possessed by ideas which recur as a result of the so-called "perseverative tendency."[4] Thus Foster quotes the above mentioned investigators as follows:[5]

1. After one has been busy for several hours in attentive observation of a phenomenon, such for instance as the movement of a pointer on a scale, the phenomenon may suddenly present itself again, in image, with the distinctness of sensory experience, especially at times when attention is not demanded in other directions (Fechner's phenomena of sensory memory).

2. Impressive experiences sometimes reappear in the form of hallucinations, at least at times when attention is not demanded strongly in other directions.

3. A long continued motor activity sets up in the lower centers a tendency automatically to continue or repeat the activity. After a strong disposition of this sort has been established, the center affected may 'reel off' the activity for a certain length of time, without the necessity of further incitement (Motorische Einstellung).

4. Cases of perseveration, in the sense of the psychiatrists.

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[3] C.Neisser, "65 Sitzung Des Vereins Ostdeutcher Irren Aerzte," Allg. Zsch. f. Psychiatrie, 1894, 51, 1016.

[4] G.E.Muller and H. Pilzker, "Studien der Gedächtniss," Zsch. f. Psychol., Erg. 1, 1900.

[5] W.S.Foster, "On the Perseverative Tendency," American Journal of Psychology, 1904, 25, 393-428.

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[5] W.L. Foster, "On the Perseverative Tendency," American Journal of Psychology, 1904, 20, 323-404.

5. Quite against our will, ideas and thought in which we have been deeply interested for some time---melodies, chess games, and the like, may keep coming back into out minds.

6. We often make mistakes, in reading, hearing, speaking or writing words where words had in mind previous to the mistakes seem, by their continuance (Nachklingen), responsible for the disturbance.

7. In experiments on memory, ideas given as reactions in the first part of the series may recur during the latter part of the series without the volition of the observer, and without any evidence of special reproductive tendencies.

8. In spite of instructions not to think of the series, many observers cannot prevent certain syllables of a series which they have learned from coming to mind in the interval between the learning and the test.

9. In experiments by the methods of right associates, not only may a syllable which has caught the observer's attention be given once or oftener as a response in the rest of the series of which it was a part, but it may also recur as a response on a number of later days (habituelle Aushilfssilben).

10. Incorrect responses, in which the syllable spoken is a syllable from the series, but is given in the wrong place, are much more frequent in tests which follow at longer intervals, even though the number of correct responses in the two cases is approximately the same.

11. Series tested after a short interval give shorter reaction times than series tested after long intervals, even though the number of correct replies is approximately equal in the two cases....

12. Mental activity during a period shortly after learning not only disturbs the associative connections (retroactive inhibition), but also brings it about that the syllables are less likely to rise freely into consciousness.

13. Observers differ greatly in respect to the degree in which the above mentioned symptoms of perseverative tendency appear.

The conception of perseveration was considerably broadened and supplemented by the later contribution of Otto Gross,[6] who drew largely upon his psychopathological clinical experience. However, as he says in the introduction to his monograph,---psychotic material merely accentuates certain qualities and gives us a chance to study the extremes from the

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Mental life is divided by Gross into the primary functions, which are synonymous with regular perception and ideation, and secondary functions, or after-functions. According to him:[7]

> In every nervous element the functional stimulation of which means a representation in consciousness, there lingers after the disappearance of that representation from consciousness, an after-function which no more possesses a correlate in consciousness and which has a further directive effect upon the associational activity.

This "Nachfunction" or "Sekundaerfunction," as he later refers to it, is according to Gross, different in different individuals. The strength and intensity of that secondary function is dependent on the type of consciousness possessed by the person in question. At this point the author resorts to a dichotomy which apparently had considerably influenced Jung in his creation of Introversion and Extroversion. Gross seems to classify human consciousnesses into two main types---the "narrow and deep" type and the "broad superficial" type of consciousness. The latter type finds its most extreme and salient expression in the manic condition of insanity in which:[8]

> ....der Reiz von aussen ist staerker als die Sekundaerfunction frueherer Vorstellungen, das individuum wendet sich ungehemmt mit seiner Aufmerksamkeit dem ausseren Reizen zu.*

Thus there is the ability to shift quickly from one stimulus to another, from one activity to another without too much interference on

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[7] Ibid, 10. (Translation---my own.)
[8] Ibid, 22.

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account of the lag of the secondary function.

The former type, however, does not shift his attention so quickly. In this "narrow and deep" consciousness "Vorstellungen" persist, make many connections and, skipping from subject to subject, from stimulus to stimulus, are prevented by the strong power of an enhanced secondary function. On the pathological side melancholia is an important harbor for that lag and after-function and, thanks to the latter, it is characterized by that monotony due to the existing "Intrapsychic Stereotypy."[9]

As a consequence of this characterization of psychiatric groups, on the basis of the strength of their secondary function, he also comes to the typology among normals, i.e. to perseverators of narrow consciousness and to non-perseverators of broad consciousness. One thing must be reiterated, though stated in Gross' words on an ealier page---the secondary function that persists modifies the mental processes that follow it. It is essential in reasoning and in connecting "Vorstellungen," it lends a certain continuity to the mental process. The manic flight of ideas shows extremely little secondary function in contradistinction to the melancholic and paranoiac, whose excess of the secondary function keeps him dwelling on the same subject.

Thus, while Muller and Pilzecker spoke of ideas having forces that appear suddenly into consciousness as a result of favorable conditions (no other strong forces present), Gross posited a similar notion of a secondary function, characteristic of nervous plasm persisting for a time as an after-function, unconscious, though influential in subsequent mental activity.

Special importance is attached by Jung[10] to the phenomenon which was

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> Der Steigerung des Sekundaerfunction entsprich eine Verengung und event. eine Vertiefung, des Herabminderung der Sekundaerfunction eine Verflachung und event. eine Verbreitung des Bewusstseins.*

Jung[13] acknowledges his debt to Gross in his outline of the extrovert type which essentially coincides with Gross' broad and shallow consciousnesses, characteristic of the short secondary function of time. The long secondary function, especially in affective life, characteristic of the "deep and narrow" type of Gross and the "Strong relief given in this picture to the inner processes and the emotional life...."[14] reveal the introvert immediately.

It was not strange that many investigations, as a result of psychiatric observations, and the above-mentioned theoretical considerations, were devoted to the exploration and the establishment of the true relationship

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11 Ibid, 106.
12 O. Gross, Die Zerebrale Sekundaerfunktion, 18, 1902.
13 C. Jung, Psychological Types, 341, 1926.
14 Ibid, 346.

*The rise of the secondary function represents a narrowing and, eventually, a deepening and the decrease of the secondary function, a shallowing and eventually a broadening of consciousness. (Translation---my own.)

bated at by Gross and was termed emotional perseveration. From his studies on the association processes Jung observed that "....they (the perseverated words) always contain something of importance for the individual psychology of the test person."[11] One might say that association words which reveal a great deal of secondary function also reveal high emotional tone or "complexes" behind them. Even more significant than the above is the close connection between Jung's typology and that of Gross. The latter showed two processes which are widely separated from each other in regard to the secondary function and which serve as a basis for the typology.[12]

Der Steigerung des Sekundärfunktion entspricht eine Verengung und event. eine Verflachung, der Herabminderung der Sekundärfunktion eine Verflachung und event. eine Verbreiterung des Bewusstseins.*

Jung[13] acknowledges his debt to Gross in his outline of the extrovert type which essentially coincides with Gross' broad and shallow consciousness, characteristic of the short secondary function of time. The long secondary function, especially in affective life, characteristic of the "deep and narrow" type of Gross and the "strong relief given in this picture to the inner processes and the emotional life...."[14] reveal the introvert immediately.

It was not strange that many investigations, as a result of psychiatric observations, and the above-mentioned theoretical considerations, were devoted to the exploration and the establishment of the true relationship

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11 Ibid, 108.
12 G. Gross, Die Zerebrale Sekundärfunktion, 16, 1902.
13 C. Jung, Psychological Types, Zur, 1923.
14 Ibid, 316.

*The size of the secondary function represents a narrowing and, eventually, a deepening and the decrease of the secondary function, a widening and eventually a broadening of consciousness. (Translation--my own.)

between the extremes, as well as the finer groupings of extroversion and introversion, and the secondary function or the perseverative tendency.

The extremes on the introversion-extroversion continuum were to be found in the psychopathological groups; the melancholics were considered to be on the introvert end of the scale, while the manics were at the other end of extroversion. The less extreme cases were those of normal individuals whose tendencies put them more or less definitely in one category (introvert or extrovert).

No discussion of the historico-theoretical background of perseveration would be complete without mentioning the impetus given by Spearman to the further experimental research in this field. He admits that on the basis of what is known thus far, perseveration is only a "half truth", especially as far as its establishment as a true faculty is concerned; but investigations of it have furnished "....the most lavish of promises for individual psychology."[15]

Spearman formulated a law of "lag or inertia" which states that "Cognitive processes always both begin and cease more gradually than their (apparent) causes."[16] Spearman, in his discussion of perseveration, however, is not quite satisfied with what is known about perseveration, though the experimental evidence quoted by him seems to point towards its establishment as a group factor possessing functional unity. This latter conclusion, as it will be pointed out later (Chapter II), was a bit of premature optimism, since more critical experimentation seemed to shatter its foundations and put under question its right to existence. Of great interest to Spearman

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15 C. Spearman, The Abilities of Man, 306, 1927.

16 Ibid, 291.

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[15] C. Spearman, the Abilities of Man, 306, 1927.
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is "....how this second universal factor stands in relation to 'g'."[17] Since "g" is the general factor of intelligence and "p" (perseveration) is another factor---its degree of inertia; the relation between the two is a cardinal problem worth investigating.

Concluding this section it would be, perhaps, best to state Edwards'[18] summary of the types of perseveration which will restate briefly the main characteristics of the phenomenon.

> When a given note or combination of notes is struck there may be a continuance of sensory impressions long after the stimulus has ceased. Secondly, there may be a later spontaneous revival into consciousness of the note or combination of notes without the original stimulus. Thirdly, there may be the continuance of the past experience which hinders the reaction to a present experience, usually related to the former.

Thus, three phenomena are emphasized above, which seem to summarize perseveration in action---(1) continuance, (2) spontaneous recurrence, which is quite akin to continuance, and (3) interference, which is also a result of continuance of sensations or their inertia - "Nachfunction."

C. Perseveration and Physiology

Some of the earlier objections to the term perseveration or perseverative tendency were raised on physiological grounds as well as on psychological ones. Thus Foster states:[19]

> Not only may the necessity of supposing a spontaneous recurrence of mental contents be questioned, but a spontaneous activity of the nervous system, which seems thereby to be implied, is also made improbable by physiological facts so far known.

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[17] Ibid, 306.

[18] K.H.R.Edwards, "The Perseverative Tendency," The Journal of Abnormal and Social Psychology, 1933, 28, 198-203.

[19] W.S.Foster, "On the Perseverative Tendency," American Journal of Psychology, 1914, 25, 393-428.

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17 Ibid, 306.

18 A.E.R. Edwards, "The Perseverative Tendency," The Journal of Abnormal and Social Psychology, 1922, 20, 196-209.

19 C. Foster, "On the Perseverative Tendency," American Journal of Psychology, 1914, 25, 283-326.

Foster's objection on the basis of physiological improbability might have been well-based twenty-five years ago; however, present-day physiology does recognize a certain inertia and spontaneity in the nervous system. Forbes, in his discussion of "The Mechanism of Reaction",[20] speaks of "after discharge, i.e., persistence of responses after stimulation has ceased, often for several seconds." He further explains the term as "The continuous discharge of impulses in the motor neurons for several seconds after the cessation of afferent stimulation...."

As a matter of fact, the physiological foundation of perseveration has been assumed for some time, especially, in the last decade or so, during which physiological sophistication has grown in psychology. For some investigators, the physiological counterpart of the psychological phenomena forms a necessary part of the definition of the term. It is especially characteristic of a fairly recent tendency to reduce concepts to their "ultimate physical or physiological truths or entities." One of these investigators says it rather clearly and concisely:[21]

> Perseveration may be defined as the tendency of a set of neurons, once excited, to persist in the state of excitation autonomously, showing resistance to any change in this state.

Pavlov,[22] in referring to the kind of perseveration observed in mental patients, speaks of a "....pathological inertness in the motor area of the cortex."

The entire host of experimenters with the electro-encephalograms must

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[20] C.Murchison, (ed.) The Foundations of Experimental Psychology, 147-151, 1929.

[21] H.H.Jasper, "Is Perseveration a Functional Unit Participating in all Behavior Processes," Journal of Social Psychology, 1931, 2, 28-51.

[22] I.P.Pavlov, "An Attempt at a Physiological Interpretation of Obsessional Neurosis and Paranoia," Journal of Mental Science, 1934, 80, 190.

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recognize a certain automaticity and spontaneity of nervous action in the brain, as demonstrated by the action potentials in their sundry variations. The waves (brain waves), as concluded by various investigators, "are due to a spontaneous beat of an area of the occipital cortex concerning with pattern vision; when the cells of this area are not engaged in visual activities they tend spontaneously to discharge impulses at a fixed rate."[23]

Moreover, studies on brain potentials do not only definitely establish the spontaneity of central nervous activity, but they also show the perseverative tendency in the cortical activity ("Berger Rhythm") itself. Since light abolishes the rhythm of cortical electrical activity, "Perseveration time is, therefore, the time between the removal of the stimulus (in this case, light) and the reappearance of the potential rhythm."[24]

Experimenting on the basis of this assumption, the investigators found significant (though as yet uninterpreted) individual differences in perseveration time. Differences in perseveration time by this method were obtained by the same investigators when meaningful and meaningless words were presented to the subjects.[25]

On the basis of the above presented statements and results from modern physiology and fields of psychological investigation it is safe to conclude that there is in existence a spontaneous activity in the central and, consequently, in the peripheral nervous system. Since that spontaneous activity does not exist directly in the nervous system and since persev-

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[23] C.H.Best and N.B.Taylor, The Physiological Basis of Medical Practice, 1404, 1937.

[24] L.E.Travis and R.J.Knott, "Brain Potential Studies of Perseveration 1. Perseveration Time to Light," Journal of Psychology, 1936, 3, 97-100.

[25] Idem, "Brain Potential Studies of Perseveration 11. Perseveration Time to Visually Presented Words," Journal of Experimental Psychology, 1937, 21, 353.

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[24] H. Gast and R. Taylor, The Physiological Basis of Mental Training, 1964, 1957.

[25] Travis and R.T. Knott, "Brain Potential Studies of Perseveration I. Perseveration Time to Light," Journal of Psychology, 1938, 6, 97-100.

[26] Idem, "Brain Potential Studies of Perseveration II. Perseveration Time to Visually Presented Words," Journal of Genetic Psychology, 1939, 55, 328.

eration is a directly observable characteristic even of that spontaneous activity itself, it appears to be quite clear that psychological phenomena grouped under the term perseveration rather gain their validity in terms and in the light of modern physiology.

D. Perseveration in Psychiatry

The phenomenon of perseveration has been noticed as a constant characteristic of some mental disorders long ago. It was not named as such until Neisser (See page 4) introduced the term. Even after the introduction of the term, Kraeplin as well as other psychiatrists grouped perseveration as part of the clinical picture in schizophrenia.[27]

> Wir finden bei der schizophrenie auch manchman eine besondere Art der Perseveration, die allerdings in ihren spezifisehen Eigentuemlichkeiten noch nicht recht zu beschreiben ist, obwohl wir annehmen muessen, dass sie sich von anderen Formen untersecheidet. Zufaellige psychische Vorgänge, Gedanken in allen Varianten Zusammenhangen immer wieder gedacht und ausgesprochen, 'zu Tode gehetzt.'....*

He further discusses perseveration in connection with organic psychoses. There the tendency to distinguish it from stereotypy is present; the distinction, however, does not seem too clear.[28]

> Jedefals ist etwas ganz anderes als die Stereotypie die Perseveration der Organischen, die wir am typischsten bei groben

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[26] E. Kraeplin, (R.M.Barclay, Trans.) Dementia Praecox and Paraphrenia, 21-63, 1919.

[27] E. Bleuler, Lehrbuch der Psychiatrie, 61, 1918.

[28] Ibid, 110.

*We find in schizophrenia a special kind of perseveration which cannot be yet described, in all its specific characteristics, though we have to assume that it is differentiated from all other kinds. Casual psychic processes, thoughts in all kinds of connections are always thought again and repeated continuously. (Translation---my own.)

Hirnherden, namentlich Aphasikern, sehen. Die Kranken kommen von einem Wort, dass sie eben gehoert oder namentlich gesprochen, nicht ab und wiederholen es, wenn sie etwas anderes sagen wollen, bestaendig. Auch wenn die Patienten eine einfach Handlung ausfuehren, ja bloss etwas denken wollen, geht ihren unter Unstaenden der Impuls gegen ihren Willen in die Bahn der vorhergehenden Handlung oder des unmittelbar vorher gedachten.*

Many additional clinical descriptions of perseveration in psychotics of different and varying diagnoses could be quoted; space will not permit that. But, a clearer line of demarcation between stereotypy and perseveration was drawn at a later date.[29]

....over activity may consist of a repetition of movements with little or no diversity....Such an oft-repeated movement is known as stereotypy....Perseveration, or the repetition of a recent movement in spite of the patient's effort to produce a new movement, is to be distinguished from stereotypy. It is in its particular instances transient, requires a stimulus, and is associated particularly with cases showing changes in the brain substance.

Thus it appears that perseveration as such is more fluctuating and less constant than the phenomena classified under the heading of stereotypy.

The tendency to perseverate was also observed in mental patients during their subjection to the association test. Thus Bleuler[30] and Jung[31] give detailed descriptions of the tendency to perseverate. Some words are used in reacting continuously to different stimulus words prescribed by the experimenter. However, Jung emphasizes the special connection of the perseverated words with emotional content. Thus, here again, perseveration

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[29] D.K.Henderson and R.D.Gillespie, A Textbook of Psychiatry, 3rd ed., 83, 1933.

[30] Bleuler, op.cit., p.56.

[31] C. Jung, Collected Papers on Analytical Psychology, 1922.

*Quite different from stereotypy is perseveration which we especially see in cases of aphasia. The patients do not turn away from a word which they recently heard; they repeat it continuously when they even want to say something else. Also, when the patient performs some activity, even if he only wants to think of something, the impulse, under certain circumstances, goes against his desire in the path of the previous activity or of that thought of directly before. (Translation---my own.)

Hirnbereich, sensorielle Sphäre, etc. Die Reaktion kommt von einem Ort, dann sie aber gleichzeitig einer sensoriellen Peripherie, nicht an und wiederholen es, wenn sie etwas anderes sagen wollen, beispielsweise durch den Patienten eine einfache Benennung ausführen, ja diese etwas denken wollen, geht ihrer Unterscheidung der Impuls gegen diesen Willen in die Zahl der vorbereitenden Handlung oder des unwillkürlichen vorher geschehen."

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29 A. Hamerson and R.T. Gillespie, A Textbook of Psychiatry, 3rd ed., 1924.

30 Kraepelin, op.cit., 1904.

31 C. Jung, Collected Papers on Analytical Psychology, 1916.

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CHAPTER II

GENERAL EXPERIMENTATION ON PERSEVERATION

is described as a characteristic of a peculiar state of mentality rather than a general human characteristic.[32]

> As it often happens that an association of strong feeling tone produces in the experiment a perseveration, with a result that not only the critical association, but also two or three successive associations are imperfectly reproduced.

Generally speaking, the various clinical observations of psychiatrists concerning perseveration adopt empirically the molar view in their descriptions. They see the process as a repetition of an entire pattern of activities rather than a tendency towards perseveration in the simplest and most elementary biophysical processes (molecular view). In the experimental work done by psychiatrists and psychologists the more elementary processes related to perseveration are investigated (See next Chapter). However, the definitive difference between the psychiatric view and understanding of the term and that of the experimental psychological use is shown by Cameron, who says that "Something different from perseveration in the usual psychiatric sense is meant, whether the difference is merely of degree, is yet unclear."[33]

One can only state, in this connection, that it is the tacit assumption of the psychologist (attempts to substantiate it have been made) that perseveration is a general characteristic of all human beings, inherent in the nervous system, which, due to organic, known and unknown causes, is more salient and exaggerated in psychotic patients.

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[32] Ibid, 111.
[33] D.E.Cameron, Objective Experimental Psychiatry, 71, 1935.

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[32] Ibid. 111.
[33] K. Conrad, Objective Experimental Psychiatry, T1, 1958.

A. The Dutch School

The attention of a number of investigators was directed, at the beginning of the present century, to the hypothesis advanced by Gross concerning the "Sekundaerfunction."[1] The desire arose to test those interesting observations by means of experimentation under controlled conditions. The first investigator to deal with the secondary function experimentally was Wiersma.[2] The task before him was quite difficult; he had to invent tests and experimental procedures which would adequately test Gross' theoretical notions and empirical observations. In the main, Wiersma used three tests with which he expected to establish the rightful place of the secondary function in the psychology of individual differences. The tests were as follows: adaptation to light, adaptation to electrical stimulation and color mixture. By means of these methods Wiersma proceeded to investigate the secondary function in manic, normal, melancholic and paranoiac individuals. The underlying rationale of the tests was that length of time for adaptation to light and the strength of the electric stimulation as well as the number of the rotations of the color wheel until grey is seen, are measures of the "Sekundaerfunction." The longer the adaptation time, the greater is the strength of current, and, the fewer the number of revolutions, the greater is the secondary function. The phenomenon of adaptation being a measure of the after effect or lag of the sensory stimulation; it is a sort of sensory "Nachfunction" or inertia of activity, while the electrical adaptation and color disc demonstrate a similar type of inertia. The results of this investigation were in

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[1] O. Gross, Die Zerebrale Function, 1902.

[2] E. Wiersma, "Die Sekuendaerfunktion bei Psychosen," Journal f. Psychol u. Neurologie, 1906, VIII, 1-24.

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2 E. Wiersma, "Die Secundaerfunktion bei Psychosen," Journal f. Psychol u. Neurologie, 1906, VIII, 1-32.

accord with Gross' views;[3] their detailed analysis, however, has to be postponed until the next chapter. Wiersma did not only create methods and produce results, but also hinted at new methods and manners of attack upon the problem. In the end of the above-mentioned investigation he also points to some motor phenomena akin to the secondary function, which later became the starting point for the so-called motor perseveration tests. He observed that ".....es schwer ist, eine Bewegnung, die man laengeren Zeit in derselben Weise ausgeuebt hat, ploetzlich zu aentern."*[4] This difficulty in the sudden change of movement is suggested to be due to the secondary function or after effect of the original activity. However, it was not until later that this problem was attacked with motor as well as sensory tests.

Two other Dutch investigators, Heymans and Brugmans[5] have extended Wiersma's investigations of Gross' theories. The following tests were applied by the authors:

1. Color mixing
2. Limen for flicker
3. Light adaptation
4. Sound adaptation (after loud noise)
5. Motor perseveration
6. Errors in sentences.

The first four tests are obviously sensory and are based on a rationale identical with the one quoted above. The last two tests are motor in nature. In the fifth test, the subject wrote forty letters in the regular manner, then twenty letters in the opposite direction; the time for the last five letters of the forty and the first five of the twenty is

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[3] Ibid., 18.
[4] Ibid., 24.
[5] C.Heymans and H.Brugmans, "Intelligenzpruefungen mit Studierenden," Zeitsch. f. Psych., 1913, 7, 317-331.

* ".....it is difficult to change a movement which one has for some time preferred in the same manner." (Translation--my own.)

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[3] Ibid., 16.
[4] Ibid., 34.
[5] G. Heymans and H. Brugmans, "Ueberlichtempfindungen mit Ruhelosenden Zustand. I. Teil", 1912, 7, 317-321.

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The sixth test consists of sentences containing similar words in which the persistence of errors in reading the new sentence with similar but not identical words, is measured. Heymans and Brugmans appear to confirm the results of Wiersma and the nature of the secondary function proposed by Gross.[6] Their statement runs as follows:

> Man kann demnach sagen, dass die Ergebnisse saemtlicher vorliegender Tests sehr entschienden, auf eine Bestaetigung, was Otto Gross als Sekundaerfunction bezeichnet hat, und der Nachwirkung von Empfindungen hinweisen.**

The experimenters received an average intercorrelation of +.28. Of course the number of subjects was quite small (fifteen). Spearman[7] rightfully doubts the significance of the results.

The Dutch School began a series of investigations into the secondary function of the perseveration tendency, devised a number of tests which served as a basis for later investigations and directed their work along two main paths of inquiry in an attempt to answer the following questions:

1. What are the individual differences in regard to the secondary function among normals and psychotics?

2. Do the tests, applied in the measurement of that secondary function, have a common factor; i.e., are they sufficiently the same to

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[6] Ibid., 325.
[7] C. Spearman, The Abilities of Man, 295, 1927.

** One may therefore say that the results of the battery of tests quite decisively confirm what Otto Gross called Secondary function and show the after-effects of sensations. (Translation--my own.)

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> Man kann sagen, dass die Ungenauigkeit ausschlieber von Intelligenzder Tests sehr unabhängig, und eine bestätigung, was Otto Gross als Sekundärfunktion bezeichnet hat, und der Wechselwirkung von Empfindungen mitwirken.

The experimenters received an average intercorrelation of +.25. Of course, the number of subjects was quite small (fifteen). Spearman[7] rightfully doubts the significance of the results.

The Dutch School began a series of investigations into the secondary function of the perseveration tendency, devised a number of tests which served as a basis for later investigations and directed their work along two main paths of inquiry in an attempt to answer the following questions:

1. What are the individual differences in regard to the secondary function among normals and psychotics?

2. Do the tests, applied in the measurement of that secondary function, have a common factor; i.e., are they sufficiently the same to

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[6] Ibid., 425.

[7] Spearman, The Nature of Intelligence and the Principles of Cognition, 293, 1927.

One may therefore say that the results of the battery of tests quite decisively confirm what Otto Gross called secondary function and show the after-effects of measurations. (Translation--mine.)

measure the same thing which may run through the various activities?

The results were inadequate and inconclusive; but their stimulating value for future research was great.

B. The English School

Lankes[8] was the first English pioneer to attack, experimentally, the problem of perseveration. The tests used in his study, were the following: (a) natural rate of tapping; (b) letter writing; (c) cancellation; (d) color disc; (e) drawings; (f) narratives; (g) associative reactions and (h) essays. His results show an intercorrelation, though not a very high one. These, as well as the investigations of Jones[9] and Bernstein[10] appear to serve the main basis for Spearman's formulation of the "law of inertia" (quoted in Chapter I) and for his faith in the functional unity of perseveration. When more closely observed, the criticism of the conclusions seems to be justified. Shevach offers the following criticism:[11]

> .....The tests were administered as group tests, an inadequate procedure in view of the subtle differentiation involved. In the case of color discs the distance from the exposure slit as well as the angle of vision, was different for different members of the group...

This partial exposition of flaws in experimental procedure and technique due to group testing of perseveration (especially Lankes) raises considerable doubt as to the value of those experimental results.

Jones' battery of tests consisted of the following:[12]

(1) Writing an S, first repeatedly in the usual way, and then as

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[8] W. Lankes, "Perseveration," British Journal of Psychology, 1915, 7, 387-419.

[9] C. Spearman, The Abilities of Man, 1927.

[10] B. Shevach, "Studies in Perseveration VI. Methods for the Study of Sensory Perseveration," The Journal of Psychology, 3, 381-402.

[11] Ibid., 381

[12] C. Spearman, The Abilities of Man, 269, 1927.

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8. Lankes, "Perseveration," British Journal of Psychology, 1:3, 227-419.
9. C. Spearman, The Abilities of Man, 1927.
10. Shevach, "Studies in Perseveration VI. Methods for the Study of Memory Perseveration," The Journal of Psychology, 5, 395-402.
11. Ibid., 391.
12. Spearman, The Abilities of Man, 299, 1927.

it would appear in a mirror.

(2) Writing digits, first in the usual way, and then making the stroke backwards.

(3) Mirror drawing.

(4) First copying prose in the usual way, and then doing it without dotting the i's and crossing the t's. ("it" test). The average positive intercorrelation of these tests employed by Jones was .492, as compared with very low correlations in Lankes' work ("None of the average intercorrelations between the tests exceed plus .29").[13] The reason for it may be found in the greater homogeneity of Jones' tests involving motor activity.

Bernstein used the following tests in his investigation of 130 children:[14] tapping, S test, backward digits, reverse order letters, the "it" test, re-writing six letters mirror-wise, triangles (first, apex upward and then downward, then alternating), reversal of capital and small letters in copying a passage, copying simple geometrical figures replacing vertical lines by horizontal lines and vice versa; finally, in copying a passage, an a was to be written after every e.

The correlations seem to be lowest in Bernstein's tables, However, when the pool of the tests was correlated with estimates of the subjects' possession or lack of possession of perseverative tendencies, it gave a positive coefficient of .51. Thus, there seemed to be ample validation by an outside criterion. Spearman in his application of the tetrad difference

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13 B. Shevach, "Studies in Perseveration VI. Methods for the Study of Sensory Perseveration," The Journal of Psychology, 1936, 3, 381-402.

14 G.Bernstein, "Quickness and Intelligence," British Journal of Psychology, Mon. Suppl. 1924, VII.

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Bernstein used the following tests in his investigation of 150 children:[14] tapping, S test, backward digits, reverse order letters, the "it" test, re-writing six letters mirror-wise, triangles (first, apex upward and then downward, then alternating), reversal of capital and small letters in copying a passage, copying simple geometrical figures regarding vertical lines by horizontal lines and vice versa; finally, in copying a passage, an a was to be written after every e.

The correlations seem to be lowest in Bernstein's tables. However, when the pool of the tests was correlated with estimates of the subjects' possession of lack of possession of perseverative tendencies, it gave a positive coefficient of .31. Thus, these seemed to be simple validation by an outside criterion. Cspersen in his application of the tetrad difference

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[13] J. Shevach, "Studies in Perseveration vi. Methods for the Study of Temporal Perseveration," The Journal of Psychology, , 227-232.

[14] G.Bernstein, "Guidance and Intelligence," British Journal of Psychology, Gen. Suppl. 1924, vii.

equation[15] to all of the above-mentioned corrections concludes that ".... in general the whole of the correlations derive from only one factor."[16] This is further substantiated by the insignificant correlations with "g" and with "speed" and "fluency" as demonstrated by Hargraves.[17]

Subsequent investigations of perseveration have spread over a wide field. It was the English School, especially, that pursued the following main paths of research and experimentation:[18]

(a) The validity of perseveration and development of pertinent psychometric procedures.

(b) The relationship between perseveration and other well known major variables.

(c) The role of perseveration in personality differences.

There seems to be considerable overlap between aspects (b) and (c), also the latter aspect of research has to be assumed as including pathological categories.

However, the rest of this section will largely be devoted to aspect (a) and somewhat to (b), while the entire next chapter is devoted to the abnormal aspect of (c) since it is in line with the subject of the present investigation.

Few renovations have been made in the psychometric technique during the past twenty years. Jones,[19] besides using some of the usual sensory (visual adaptation and color disc) and motor (reverse stroke and "it") tests

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15 C. Spearman, The Abilities of Man, 73-74, 1927.

16 Ibid, 303.

17 H.L.Hargreaves, "The Faculty of Imagination," British Journal of Psychology, Mon. Suppl., 1927, 10, 1-74.

18 K.H.Rogers, "Perseveration," Journal of Mental Science, 1935, 81, 138-144.

19 L.W.Jones, "An Investigation into the Significance of Perseveration," Journal of Mental Science, 1928, 74, 653-659.

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Subsequent investigations of perseveration have spread over a wide
field. It was the American School, especially, that pursued the following
main paths of research and experimentation:[18]

(a) The reality of perseveration and development of particular
psychometric procedures.

(b) The relationship between perseveration and other well known
major variables.

(c) The role of perseveration in personality differences.

There seems to be considerable overlap between aspects (b) and (c), and
the latter aspect of research has to be assessed as involving exploratory
hypothesis.

However, the rest of this section will largely be devoted to aspect
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15 G. Freeman, The Abilities of Man, 77-78, 1957.
16 Ibid., p.82.
17 R. Burgeves, "The Reality of Imagination," British Journal
of Psychology, Gen. Sect., 1957, 10, 1-76.
18 R. Rogers, "Perseveration," Journal of Ment. Science, 1958, 81,
1-14.
19 T. Jones, "An Investigation into the Significance of Perseveration,"
Journal of Ment. Sci., 1958, 76, 641-649.

also used ideational tests that were somewhat new in character (c.f. Lankes). He used the "noun test" where the subject was to build a number of nouns beginning with a certain letter and then the letter was changed and the observations of the persistence of the previous letter in the new procedure were made. The animal test was largely a measure of speed as to how many names of animals can be stated in a given period of time. It is doubtful whether the latter is really a measure of perseveration. The "Blot test" measuring recurring responses does seem to fit into the picture of the definitions of perseveration. Moreover, later investigators on the Rorschach[20] seem to confirm the blot value, especially in the case of epileptics. Jones' main objective is not to establish the validity and reliability of his measures, since he gives no intercorrelations, but to correlate the tests with psychiatric categories.

Subsequent work by Stephenson,[21] in which five of the above-mentioned motor tests were used, points out that they have an "average intercorrelation of .40 and satisfy the tetrad criterion for two factors."[22]

Application of the same tests was common in the next few years. Epilepsy,[23] the "Resemblance of Twins"[24] with regard to perseveration as measured by the motor tests, and the high correlation between siblings[25] have all been investigated. Despite the criticism launched against the

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[20] A. Guirdham, "Rorschach Test in Epileptics," Journal of Mental Science, 1935, 81.

[21] W. Stephenson, "Studies in Experimental Psychiatry II Some Contacts of p. factor with Psychiatry," Journal of Mental Science, 1932, 78, 315-30.

[22] Ibid., 319.

[23] J.H.Ewen, "Perseveration in the Insane Epileptic," Journal of Mental Science, 1930, 76, 537-40.

[24] E.P.Yule, "The Resemblance of Twins with Regard to Perseveration," Journal of Mental Science, 1935, 81, 489-501.

[25] R.B.Cattell, "Perseveration and Personality--Some Experiments and a Hypothesis," Journal of Mental Science, 1935, 81, 151-67.

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[21] W. Stephenson, "Studies in Experimental Psychiatry II Some Contacts of p. Factor with Psychiatry," Journal of Mental Science, 1938, 78, 213-20.

[22] Ibid., 219.

[23] J.R.Newman, "Perseveration in the Insane Epileptic," Journal of Mental Science, 1930, 76, 257-10.

[24] A.T.Yule, "The Resemblance of Twins with Regard to Perseveration," Journal of Mental Science, 1933, 81, 429-301.

[25] R.B.Cattell, "Perseveration and Personality--Some Experiments and a Hypothesis," Journal of Mental Science, 1930, 81, 151-67.

customary tests[26] in which the variation in the size of the letters may upset and destroy the value of the perseveration score, which is based on the ratio of the number of letters produced in the two or more different types of activity, some investigators consider the problem of motor and sensory tests in perseveration settled. Thus, the following statement reveals the confidence of Cattell:[27]

> The validity and reliability of 'p' tests is now clearly on the increase. Nor is there any further reason to doubt that they are measuring a definite group factor 'p' in motor and sensory tests.

It may be noticed that the letter "p" is being used; it is not merely an abbreviation for the term perseveration. With the increase of research on factor analysis, the tendency on the part of previous investigators of "perseveration" is to use "p" instead. This is not merely a tacit and indirect expression of doubt as to whether the tests actually measure perseveration. It means that our present knowledge and definition of perseveration are not quite satisfactory. But, since by the means of the correlation technique, a common factor is found in many tests that claim to measure perseveration, this factor should more adequately receive a less a priori name than perseveration. Stephenson's[28] doubts are quite obvious though there is definitely "....a 'p' factor, but its explanation might lie in clearness variation and its laws...."[29]

This criticism is far from being pessimistic about the tests and about their ability to measure perseveration; it merely shows that the trend

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[26] D.E.Cameron and T.G.B.Caunt, "Studies in Perseveration," Journal of Mental Science, 1933, 79, 735-745.

[27] R.B.Cattell, "Perseveration and Personality--Some Experiments and a Hypothesis," Journal of Mental Science, 1935, 81, 151-67.

[28] W.Stephenson, "Perseveration and Character," Character and Personality, 1935, 4, 44-52.

[29] Idem, "Studies in Perseveration," Nature, 1934, 134, 860.

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[27] R.B. Cattell, "Perseveration and Personality--Some Experiments and a Hypothesis," Journal of Mental Science, 1933, 81, 181-67.

[28] W. Stephenson, "Perseveration and Character," Character and Personality, 1932, 4, 44-52.

[29] Idem, "Studies in Perseveration," Nature, 1934, 134, 880.

is away from the psychologically defined terminology towards that of "factors" where "w" replaces will and volition, "p"---secondary function and perseveration, et cetera. It is not, of course, merely a change of names. It implies that the term is getting at something more fundamental, biologically and experimentally defined.

C. Experimental Work in the United States

Much less attention was paid to the concept of perseveration in this country. There was, of course, clinical recognition of the phenomenon. Thus, White[30] and other psychiatrists and workers in the field of abnormal psychology understood it in the same sense that Neisser[31] indicated originally. A few experiments, however, follow the English tradition in experimenting with perseveration.

Cushing's study on "A Perseverative Tendency in Pre-School Children"[32] approaches and attacks the problem by giving more "natural" tests taken from the children's life-like situations. On the basis of her work, the investigator concludes in favor of a perseverative tendency as follows:[33] "The results seemed to indicate the presence of a common factor pervading the situation plus certain small group factors...."

Of course, it may be a point of contention as to whether the "persistence" of "dropping marbles through a hole into a box" is comparable to the after-sensation and after effects of an activity characteristic of the tests in the British investigations. However, according to the summary-

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30 W.A.White, Outlines of Psychiatry, 13th ed., 1932.
31 See Chapter 1, Section B. present study.
32 H.M.Cushing, "A Perseverative Tendency in Pre-School Children," Archives of Psychology, 1929, 108.
33 Ibid., 52.

It may from the psychologically defined terminology towards that of "factors" where "M" replaces will and volition, "p"---secondary function and perseveration, or others. It is not, of course, merely a change of names. It implies that the term is getting at something more fundamental, biologically and experimentally defined.

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33 Ibid., 32.

definition of perseveration to be given later, it will appear that Cushing's work is covered by the blanket term of perseveration or perseverative tendency.

The most extensive and more critical study was made by Jasper.[34] This investigator employed a long series of tests to his 78 subjects who were students at the University. The tests were sensory, motor and ideational; many of them were of the type employed in the British investigations, while additional reaction-time tests were given. Jasper does not seem to confirm the results of the English experimenters. He seems to get a negligible correlation between the types of tests (ideational, sensory and motor) with regard to perseveration. There is, however, according to him, "....some evidence for the existence of a narrower group factor of motor perseveration....."[35] Here, again, the trouble and the objection is not to the term perseveration as such. Its existence and soundness as a psychological entity is granted. But, the adequacy of the present psychometric and experimental methods in the measurements of perseveration is seriously doubted. Also the proof of the consistency of the trait throughout the activities involved in the tests is under attack. Hence, Jasper puts forth the following desiderata:[36]

> Measures must be developed which are sufficiently specific for perseveration. The measures used may be fairly reliable, but not valid measures of perseveration. Some of the measures used in this study were scored so that other factors could easily have masked a considerable portion of the 'perseverative' tendency.

Related to the last portion of Jasper's statement is also one made by

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[34] H.H.Jasper, "Is Perseveration a Functional Unit Participating in all Behavior Processes," Journal of Social Psychology, 1931, 2, 28-51.

[35] Ibid., 48.

[36] Ibid., 45.

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[34] H. Jasper, "Is Perseveration a Emotional Unit Particular Thing in all Behavior Processes," Journal of Social Psychology, 1931, 2, 34-61.
[35] Ibid., 46.
[36] Ibid., 49.

Dorcus.[37] In the conclusions of his study, he says that "...such a general factor based upon tissue condition or neural tendency may be obscured by desires and volition."[38] This last objection is not quite so sound since "volition and desires" may be related to that neural tendency or be a part of it. Further discussion of this point will take us too far afield---into the deep waters of metaphysics.

The most recent comprehensive series of studies on perseveration comes from the Harvard Psychological Clinic. Kendig and Shevach[39] have initiated that series of investigations, the former investigator--on conative processes involved in perseveration, while the second investigator (Shevach) outlined the aim of his study as follows:[40]

> (a) To determine whether sensory perseveration is a general characteristic of personality, or whether it varies in degree from one sensory experience to another.
> (b) To determine the constancy of perseveration under similar and dissimilar conditions.
> (c) To determine the influence of age upon the phenomenon.

Shevach employed a great many sensory tests (eleven). Some of them had to be discarded as a result of the inadequacy of laboratory conditions. The number of small experimental groups gave a rather low average inter-correlation of the tests used. However, some points of importance have been established in the following conclusions:[41]

> 1. Sensory perseveration of a given sensory experience manifests marked individual differences.
> 2. Sensory perseveration is manifested as a general characteristic

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[37] R.M.Dorcus, "Is there a 'Unit-Trait' of Volitional Perseveration?" Journal of General Psychology, 1935, 13, 345-356.

[38] Ibid., 354.

[39] I.Kendig and B.J.Shevach, "Studies in Perseveration, I. A Study Survey of Researches in Perseveration," The Journal of Psychology, 1936,3, 223-230.

[40] Ibid., 228.

[41] B.J.Shevach, "Studies in Perseveration, VII. Experimental Results of Tests for Sensory Perseveration," The Journal of Psych., 1936,3,403-427.

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37 H.M. Norcus, "Is there a 'Unit-Trait' or Volitional Perseveration?" Journal of General Psychology, 1928, 1:3, 385-394.

38 Ibid., 394.

39 L. Kendig and J. Shevach, "Studies in Perseveration, I. A Study of Recurrence in Perseveration," The Journal of Psychology, 1936, 2:2, 229-234.

40 Ibid., 229.

41 J. Shevach, "Studies in Perseveration, VII. Experimental Results of Tests for Sensory Perseveration," The Journal of Psych., [illegible].

in some individuals and varies in degree from one sensory experience to another amongst other individuals.

3. Psychoneurotic tendencies constitute the direct factor which underlies the variability in the degree of perseveration.

4. The degree of perseveration for a given sensory experience is constant from time to time.

Thus, the reliability and manifestations of individual differences on the basis of the sensory tests is quite definite; also, the relationship between variability and psychoneurotic tendencies and their effect upon the establishment of sensory perseveration as a general characteristic is to be noted. Another conclusion included in the final summary of the study should prove of great interest. He says:[42]

Extreme perseveration and extreme non-perseveration predispose an individual to psychic invalidism.

The status of the individuals in regard to psychoneurotic tendencies was established by means of various personality tests (Thurstone, Woodworth and Bernreuter.) The variability was finally interpreted as a result of a basically low perseverative tendency which is "disrupted" and varies from situation to situation, while the stable persons, who are somewhat high in the middle range of perseveration scores, give a more consistent picture all around. The variations in the former depend upon the emotional value of the situation.

These last results do not appear very clear-cut. To some extent, the last conclusions seem to confirm the results obtained earlier by Rogers[43] that "High and low 'Perseverators' show these tendencies ('disparities' between intelligence and school achievement) to a greater degree than did those children who come within the median ranges of the 'Perseveration'

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[42] Ibid., 426.

[43] K.H.Rogers, "A Relationship Between Perseveration and School Achievement," Psychological Bulletin, 1930, 30, 163-69.

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[42] Ibid., 429.

[43] A.H. Rogers, "A Relationship Between Perseveration and School Achievement," Psychological Bulletin, 1930, 30, 163-64.

distribution." The confirmation, of course, depends upon the agreement with the assumption that "discrepancies" are indicators of instability and psychoneurotic tendencies.

Some more work done in the psychiatric field in this country will be reviewed in greater detail in a more appropriate place. It seems, however, that, on the whole, investigators in the United States neglected the problem when compared with the output of their colleagues in England. The work is more critical. On the one hand, a narrow group factor of motor perseveration seems to be warranted by the evidence;[44] while on the other hand, there seems to be (with certain qualifications) a group factor of sensory perseveration which is a fairly stable and reliable measure.[45] Some relation between perseveration and neurotic tendencies has been established. But, little or no work was done with the motor and sensory tests and their measurements of perseveration in psychotic subjects, since the above experimenters employed normal subjects only.

D. Summary of Experimental Methods

All the methods (psychometric) employed in the measurement of perseveration or secondary function may be classified under the following headings:

1. Motor tests
2. Sensory tests
3. Ideational tests

Under the first class come different kinds of motor tests, tests which involve or regard switching from one activity to another similar to it, break-

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44 Jasper, op.cit., 2, 28-51.
45 Shevach, op.cit.,3, 403-427.

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[44] Jaspar, op.cit., 2, 25-31.
[45] Shavaob, op.cit., 6, 400-427.

ing away from well-habituated activities, "and, newly instituted mental sets."[46]

The sensory tests include adaptation phenomena, threshold sensitivities and reaction times.

The ideational tests contain "fluency" tests (animals, ink-blots, et cetera), memory (recall) tests, tests dealing with spontaneous recurrence of mental elements of association---tests, essays, et cetera) and interference tests, when the person's mental set is shown to interfere with the one following it (Noun test and others of similar nature.)

As a result of this great expansion in the field of testing perseveration, the intercorrelation of the multitude of tests is in doubt. At least, the studies thus far quoted are not unanimous in this respect. There seems to be, however, some agreement as to the intercorrelation of these tests within each one of the groups (motor, sensory and ideational).

The definition of perseveration, or as it became in psychology---mental inertia, is quite broad and inclusive and seems to include a multitude of phenomena. Both the confusion in the definition of the term as well as the host of experiments in widely differing directions, caused the broadening of its meaning. The list of the following phenomena most adequately summarizes what is meant by perseveration today.[47]

1. Tendency of ideas to spontaneous recurrence
2. Sensory lag or after effect
3. Interference effects of preceding mental processes with present

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[46] W. Stephenson, "An Introduction to So-Called Motor Perseveration Tests," British Journal of Educational Psychology, 1934, IV, 186-207.

[47] I. Kendig and S.J.Shevach, "Studies in Perseveration I. A Survey of Researches in Perseveration." The Journal of Psychology 1936,3, 223-230.

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47. Lundin and C.J.Shrauch, "Studies in Perseveration I. A Survey of Measures in Perseveration." The Journal of Psychology 1933, 323-340.

processes.

4. Tendency to continue working at a task when there is no objectively defined end.

Generally speaking, continuance seems to be the cardinal principle involved in perseveration; all the rest of the phenomena are akin, caused by and related to it.

E. Some Theoretical Considerations

We have examined here, in some detail, the theoretical and experimental foundations of a problem. It appears, as a result of this examination, that perseveration is a rather elusive trait which is not entirely independent of other variables. But, "strict independence is neither a vital nor even a reasonable requirement for human traits."[48] Some independence of the trait, some group-factor is evident. The evidence came from two directions: first,---from theoretical definitions which defined tests, which in turn, measured perseveration; an a priori method. Second,---from the experimental data and employment of statistical analysis to the discovery of general factors---the a posteriori method.

Now, it seems relatively unimportant, for all practical purposes, whether we use the term perseveration and argue for its being a universal trait occurring in all our activities, or whether we say that there is a "p" factor which was statistically derived from a great variety of tests which had their genesis and original stimulation in the theory of perseveration. They both measure the same phenomena; both approach each other from different sides of the road.

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[48] G.W.Allport, Personality, A Psychological Interpretation, p.430, 1937.

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16. Allport, Personality. A Psychological Interpretation, p.520, 1937.

Thus, the existence of the phenomena here described is undeniable; the tests used are fallible and a greater amount of "p" in new tests is to be desired,---greater, but not complete independence of other factors is to be sought. The relation to individual differences, character and personality types, is further to be investigated and explored (See Chapter III).

CHAPTER III

EXPERIMENTATION WITH PSYCHOTIC MATERIAL

A. Perseveration Correlated with the Various Diagnoses (Psychiatric)

Most of the investigators, whose work was discussed in the previous chapter, have been interested in establishing some truth concerning the unitary function of perseveration, its reliability and validity. A by-product of those investigations was the correlation of perseveration with various character and personality traits, especially along the introversion-extroversion continuum. A number of experiments, however, was devoted to the correlation and investigation of various diagnostic-psychiatric groups in regard to perseveration. It must be recalled that, after all, the genesis of the term is in psychiatry and that Gross'[1] early hypothesis definitely linked it to the greater secondary function in melancholia and the lesser in mania. Upon the basis of results obtained in investigations of abnormal subjects, generalizations were made and extended to the field of normal typology. The number of researches dealing with psychotic subjects does not seem to present a very clear picture as to the linkage of perseveration with the several diagnoses used in the classification of mental patients. Thus Wiersma[2], using three sensory tests, seems to have confirmed the theoretical predictions uttered by Gross.

The table on page 33 gives us a composite picture of Wiersma's[3] results. The results were not quite adequately presented by Spearman, who reported that the number of subjects employed in Wiersma's investigation consisted of nine manics, eleven normals and eighteen melancholics. It appears that this was the largest number in any single experiment (color

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1 O. Gross, Die Zerebrale Sekundaerfunktion, 1902.
2 See Chapter II, Section A, present study.
3 E. Wiersma, "Die Sekuendaerfuenktion bei Psychosen," Journal f. Psychol u. Neurologie, 1906, VIII, 1-24.

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TABLE I

SENSORY PERSEVERATION IN NORMALS AND PSYCHOTICS (Wiersma)			
Experiment	Manic	Normal	Melancholic
Electric Adaptation	0 3	39.6 5	205.5 4
Color Disc	27.2 11	15.7 9	12.2 18
Light Adaptation	33.5 7	102.9 4	233.2 18

TABLE II

JONES' RESULTS

TEST	MANIA	NORMALS	MELANCHOLIA
Adaptation I	54	41	38
Adaptation II	45	31	25
Color Red Green	443	682	541
Color Blue Yellow	447	674	483

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Color Disc	27.3 11	18.7 9	12.2 15
Light Adaptation	45.3 7	102.8 4	323.2 10

TABLE II

TOTAL RESULTS

TEST	MANIA	NORMALS	HYPOCHONDRIA
Adaptation I	34	41	36
Adaptation II	45	31	23
Mad Color Drawl	543	682	641
Alive Yellow	447	674	423

disc), but not in the other two. The number of subjects upon whose results the means of the table are based is given in the corner of each square and is evidently much smaller for any single tests than those reported by Spearman. On the basis of these results, the manic - normal - melancholic order of increasing perseveration was established; thus, supposedly confirming Gross' contentions. Two points of criticism, however, must be leveled at the conclusiveness of these results. First, the number of subjects employed is really, statistically, inadequate and hence, the conclusiveness of the results is impaired. Second, from the present writer's own analysis of Wiersma's data and from what is to be expected when comparing manics with melancholics, the observation must be made that there is a considerable age difference between the two groups. The manics as a group were much younger than the melancholics; most of the former were in their twenties, while the melancholic group was composed of much older persons.

These critical notes are to be born in mind since their significance for the present investigation is of great importance.

About twenty years after Wiersma's study was published a similar investigation with apparently contradictory results was undertaken and completed.[4] The old sequence of manic-- normal - melancholic in regard to the degree of perseveration is altogether reversed on the basis of two of the sensory tests (Adaptation and Color Disc). The table on page 33 presents Jones' composite results on the two tests.[5]

Thus, manics, according to Jones' results, need a longer adaptation

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[4] C. Spearman, The Abilities of Man, 294, 1927.

[5] L.W.Jones, "An Investigation into the Significance of Perseveration," Journal of Mental Science, 1928, 74, 653-659.

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[4] C. Spearman, The Abilities of Man, 234, 1927.
[5] L.V.Jones, "An Investigation Into the Significance of Perseveration," Journal of Mental Science, 1938, 74, 838-839.

time than do melancholics and normals, hence, they are greater perseverators (since the after-effect persists longer). Also, the manics lost the two colors of the sectors of the color disc much sooner, after fewer revolutions, than did the melancholics; in other words the manic patients needed fewer rotations of the disc per minute before the individual colors blended, and, consequently, the persistence of the sensations of the individual colors was longer and more effective. Thus, the manics, again, were the greater perseverators. The sequence in regard to sensory perseveration seems to be reversed, i.e., melancholia - normals - mania. The rest of the study (Jones) seems to be independent of the first part. Motor and ideational tests are used to measure "fluency" and it is concluded that "....the results bear out the general view as to the "fluency" of associations in mania and the lack of associations in melancholia."[6] The question of the relation between fluency and perseveration seems to be quite unsettled, since the author dares to conclude tentatively that "In any case these preliminary results seem to weaken the validity of the view that manic patients are non-perseverators in sensory or motor tests."[7] Another point has to be emphasized in this connection: the intercorrelation of the tests was quite high in melancholia (motor and ideational) but very low in mania. Whether "large variations in type" may account for it is not yet known.

This study, then, contradicts the results of Wiersma on the basis of sensory tests only. It presents a very unclear picture regarding the existence of the same factor in motor and ideational tests--neither have differences in degree of perseveration between the several psychiatric

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[6] Ibid., 657.
[7] Ibid., 659.

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[6] Ibid., 497.
[7] Ibid., 499.

categories, been clearly demonstrated. Mania and melancholia have been separated on the basis of "fluency", but the connection and relation between fluency and perseveration is definitely not indicated , and proof of its existence is wanting.

A more extensive attack upon the problem, according to the advice of Spearman,[8] was undertaken by Stephenson[9] some years later. His experiments were strictly confined to the motor type of test which was used throughout the series of investigations with psychotic and normal subjects.

The table on page 37 is a composite of the results obtained in the above-mentioned study.[10] About 150 subjects were used; among them were some normals and a great many psychiatric categories and sub-classes. According to the median score on "p", for every group (see table) the manic patients are lowest, next are the paranoiacs and other delusionals, epileptics, normals, depressive manic-depressives, melancholics and dementia praecox with high "p".

We have not mentioned one group included in the table since it needs special explanation. The "dementia supervening cases" with a comparatively high "p" score are those cases which show great deterioration (probably due to brain lesions) and which include some cases of general paresis and other cases described in the next paragraph:[11]

> The results that we have to show agree to some extent, in that manic cases involving supervening dementia do not give low 'p' scores; we find,

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[8] C. Spearman, "The Tenth Maudsley Lecture," Journal of Mental Science, 1929, 75, 357-370.

[9] W. Stephenson, "Studies in Experimental Psychiatry 11 Some Contacts of p. - factor with Psychiatry," Journal of Mental Science, 1932, 78, 315-330.

[10] Ibid.

[11] Ibid., 325.

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8. Spearman, "The Psychological Lecture," Journal of Mental Science, 1923, 76, 337-376.

9. Stephenson, "Variation in Psychomotor Ability in Some Contacts of Psychotic with Psychotic," Journal of Mental Science, 1927, 73, 318-329.

10 Ibid.

11 Ibid., 329.

TABLE III

P-SCORES FOR PSYCHOTICS AND NORMALS (Stephenson)

SUBJECTS	NUMBER	MEDIAN P SCORES	SCORE AND ESTIMATE
Paranoiacs	21	2.5	9
Other delusionals		4	
Dementia Praecox with high P		17	45
Other Cases of Dementia Praecox	25	4	9
Melancholics	21	9	30
Manic-depressive Psychosis (Depressive Phase)	14	7	23
Maniacs	9	1	5
Epileptics	14	5	14
Dementia Supervening Cases	19	12	32
Normal	20	5	16

TABLE III

F-SCORES FOR PSYCHOTICS AND NORMALS (STEPHENSON)

SUBJECT	NUMBER	MEDIAN F SCORES	SCORE AND ESTIMATE
Paranoiacs	21	2.5	2
Other Schizophrenia		4	
Dementia Praecox with Mean F		17	45
Other Cases of Dementia Praecox	25	4	2
Melancholics	21	2	20
Manic-depressive Psychosis (Depressive Phase)	14	7	25
Neurasthenics	2	1	3
Epileptics	14	5	14
Dementia Supervening Cases	19	12	32
Normal	20	5	16

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Thus we actually have two types of manics---the non-deteriorated and the deteriorated which cannot be classed with the former. Moreover, according to Stephenson's optimistic views, the correspondence between a high p-score and degree of deterioration in manics is so definite and consistent that "....the use of the 'p' tests in the manic group....might be of service in objectively helping to decide upon matters of mental reduction and deterioration."[12] Hence, the statement concerning the manic as non-perseverators is robbed of its universality and must be qualified.

The dementia praecox group also presents very interesting results. The distribution of the perseveration scores of this group would produce practically a bi-modal curve. There is one group (see Table II, page 33) with a very high "p" score and another group with an extremely low "p" score ---nearly approaching the delusionals and paranoiacs. Hence, this lack of uniformity and point to point correlation with the diagnoses may seemingly cause us considerable doubt concerning the value of the "p" tests in this connection. Stephenson foresaw this and investigated the problem more thoroughly in his next study.[13] This study confirmed the clinical observations made in the earlier study---namely: that high "p" correlates with low accessibility of the patient and vice versa, low "p" with greater accessibility. Thus, in cases of dementia praecox the state of psychosis can fairly well be determined on the basis of the "p" tests. Stephenson's own statement concerning this matter goes as follows:[14]

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[12] Ibid., 326.

[13] W.Stephenson, "Studies in Experimental Psychiatry: III. p.-score and Inhibition for High p.-Praecox Cases," Journal of Mental Science, 1932, 78, 908-920.

[14] Ibid., 913.

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....in agreement with the picture of psychiatric change from inaccessibility and very uncontrolled behavior to greater accessibility and quickness, there is shown marked decrease in 'p'-score.

The author even concludes that the "p" tests may serve as a "barometer" for psychiatric condition. Elaborate theories are brought to the fore as a result of the data obtained, however, we shall confine ourselves to the actual results based on experimental work and make our own deductions later in this paper.

The manic-depressives seem to occupy a middle position in regard to the "p" score, while the melancholics appear highest. Thus, it appears that Wiersma's arrangement of manic, normal, melancholic, in regard to perseveration and in contradistinction to Jones' results, still stands. However, an attachment of a number of qualifications (dementia supervening cases) is necessary. Other investigations,[15] carried out around the same time, seem to corroborate Stephenson's and, consequently, Wiersma's view in regard to perseveration in melancholia.

Parenthetically, it may be interesting, also, to observe that the results concerning epileptics in the above quoted studies hardly agree with other studies comparing normals on the same level in regard to perseveration. Ewen[16] obtained results that are diametrically opposed to those and prove distinctly the epileptics to be much higher perseverators than normals. Of course, Ewen only used one motor test while the others were sensory (2) and ideational (2) tests. The results led him to conclude that they show "....that perseveration is a feature of the peculiar mental state

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[15] J.W.Pinard, "Their Relation to Certain Psychopathic Conditions and to Introversion," British Journal of Psychology, 1932, 23, 114-127.

[16] J.H.Ewen, "Perseveration in the Insane Epileptic," Journal of Mental Science, 1930, 76, 537-540.

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[15] J.W.Finch, "Their Relation to Certain Psychopathic Conditions and to Introversion," British Journal of Psychology, 1932, 22, 144-157.

[16] J.H.Hoch, "Perseveration in the Insane Epileptic," Journal of Mental Science, 1930, 76, 327-330.

of insane epileptics between attacks...."[17] One may wonder whether the type of tests in one investigation and the different type in the other may account for the disagreement in results and conclusions.

Throughout the studies, thus far reviewed, there was no mention of age control. The question may arise as to whether variations in age do not mask considerably the actual results. Stephenson confesses this weakness: "....age differences and the like are perhaps focal points of criticism."[18]

A later investigation[19] seems to have brought the fact of age differences more to the foreground. Even though the Table[20] IV below does not show "striking" differences in "p"-scores due to age differences, some increase with age (general tendency) is evident. That increase

TABLE IV

Average	Number	P - Score
21.2	9	45.9
26.5	14	50.5
32.6	18	50.0
44.1	11	50.6

Cattell's Results

comes to an even level at the age of 26 or so, but, what happens beyond 44.1 is not yet known. There may be a much greater increase in the 50's

[17] Ibid., 540

[18] W.Stephenson, "Studies in Experimental Psychiatry 11 Some Contacts of p.-factor with Psychiatry," Journal of Mental Science, 1932, 78, 330.

[19] R.B.Cattell, "On the Measurement of 'Perseveration,'" British Journal of Educational Psychology, 1935, 5, 76-92.

[20] Ibid., 87.

of insane epileptics between attacks...."[17] One may wonder whether the type of tests in one investigation and the different type in the other may account for the disagreement in results and conclusions.

Throughout the studies thus far reviewed, there was no mention of age control. The question may arise as to whether variations in age do not mask considerably the actual results. Stephenson confesses this weakness: "....age differences and the like are perhaps focal points of criticism."[18]

A later investigation[19] seems to have brought the fact of age difference more to the foreground. Even though the Table[20] IV below does not show "striking" differences in "g"-scores due to age differences, some increase with age (general tendency) is evident. That increase

TABLE IV

Average	Number	E - Score
21.2	3	42.2
25.5	14	50.5
32.8	18	50.0
44.1	11	50.6

Cattell's Results

comes to an even level at the age of 20 or so, but, what happens beyond 44.1 is not yet known. There may be a much greater increase in the 50's

[17] Ibid., 340

[18] Stephenson, "Studies in Experimental Psychology II Some Contrasts of g.-Factor with Personality," Journal of Mental Science, 1929, 75, 320.

[19] R. B. Cattell, "On the Measurement of 'Perseveration,'" British Journal of Educational Psychology, 1935, 5, 75-92.

[20] Ibid., 87.

and 60's just as there is a considerable increase from childhood to adulthood[21] or from early childhood to puberty.[22]

This "focal point of criticism" must be born in mind, since it is also focal and of considerable import in the present study.

A comparatively novel experimental approach to the study of perseveration was recently demonstrated in the work of Mays[23] and Shipley.[24] Mays starts out with clinical observation of the great tendency toward perseveration on the part of catatonic patients and makes the following statement:

> Since most of the clinically observed perseverations are reactions dependent on a 'voluntary' control, the question may be raised whether such repetitive activity extends likewise to the processes under autonomic control.[25]

The question was answered in the affirmative by the data obtained in the study in which the psychogalvanic response to certain sound patterns was used as a measurement of perseveration. "Catatonics showed two or more times as much perseveration as normals in all comparisons."[26]

Shipley's[27] results are based on four tests of autonomic perseveration which was measured by means of the psychogalvanometer. The tests were as follows:

1. Resistance to adaptation

---

[21] J.W.Pinard, "Tests of Perseveration," British Journal of Psychology, 1932, 23, 5-19.

[22] M.Dybowski, "Perseveration as a Measure of Negativism, and its Estimation by Means of Photographs," Kwartolnik Psychologiczny, 1935, VI, 221-236.

[23] L.L.Mays, "Studies in Catatonia V. Perseverational Tendencies in Catatonic Patients," The Psychiatric Quarterly, 1934, 8, 728.

[24] W.C.Shipley, "Studies of Catatonia VI. Further Investigation of the Perseverative Tendency," The Psychiatric Quarterly, 1934, 8, 736-744.

[25] Mays, loc.cit., 728.

[26] Ibid., 735.

[27] Shipley, loc.cit.,742.

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[23] J.J.Maye, "Studies in Catatonia V. Perseverational Tendencies in Catatonic Patients," The Psychiatric Quarterly, 1934, 8, 728.

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[25] Maye, loc.cit., 721.

[26] Ibid., 723.

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2. Conditionability

3. Resistance to experimental extinction

4. Irradiation

The combined "p" scores in the table below seem to establish a sequence which is in agreement with that of Stephenson. The final results of the combined "p" scores are as follows:[28]

TABLE V.

Schizophrenia	Manic-depressive	Psychoneurosis	Normal
91	80	72	53

Shipley's Results

On the whole, the consistency between the tests is quite good and the schizophrenia - manic-depressive - psychoneurotic - normal sequence may be considered as established. However, neither Shipley nor Stephenson gives measures of reliability which would consolidate their results. A mere comparison between means, especially between small groups, is of little significance. The sampling error may be so great, that in absence of critical ratio values, the results cannot be accepted as truly indicative of definite tendencies.

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The last section was quite serviceable in contributing to us a

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considerable number of disagreements between investigators and their experimental results. Those disagreements lead to an inconsistent and a faulty understanding of the respective psychiatric categories by means of perseveration measurements; this inconsistency also complicates and hinders our understanding of perseveration itself. This relationship between psychiatric categories and classifications and degrees of perseveration must be cleared up. What, in brief, are the bones of contention?

1. In the first place, regarding the manic - normal - melancholic sequence, the results of Jones and Wiersma, discussed above, are diametrically opposed to each other. Consequently, the following questions will have to be answered:

(a) Are the melancholics of Wiersma and Jones of the same category? This may have a partly negative answer; there is some historical evidence that early in this century Wiersma bunched depressives and involutional melancholics in the same group. Jones, however, must have used only involutional melancholics in accordance with present usage of the term. Hence, there may be a discrepancy as a result of the different types employed.

(b) Some of the high "p" manic patients of Jones may have had "dementia supervening" described by Stephenson. Thus, what is, actually, the difference between manics and demented manics?

(c) Since there are age differences, among the patients, which were not taken into consideration as a variable, what is the effect of those differences, if any?

2. In the second place, the relationship between the psychoneuroses and perseveration is still an open one. Shevach showed a relationship

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between psychoneurotic tendencies and variability in perseveration, while Shipley considered hospitalized psychoneurotics greater perseverators than normals.

In this connection, two points are to be born in mind:

(a) We do not know whether normals with psychoneurotic tendencies are related to stable normals as psychoneurotics are to "normals" in general.

(b) The two investigators used widely differing methods in the measurement of perseveration. Sensory tests were used by one (Shevach), while the psychogalvanic response was used by the other (Shipley).

3. In the third place, the relationship between schizophrenia and manic-depressive psychoses in regard to perseveration is still not clear. Shipley considers the schizophrenics higher perseverators than manic-depressives, while Stephenson presents a different sequence in order of increasing perseveration: manic - "low p" dementia praecox - manic depressive - "high p" praecox. The following questions suggest themselves:

(a) Are not the high "p" and low "p" groups in schizophrenia due to the various types within the general category?

(b) Is there a consistently high perseverative tendency in catatonics when compared with other schizophrenics in accordance with the clinical picture?

(c) How are the various states in the manic-depressive psychoses to be compared with the different classification in schizophrenia?

Answers to all these questions may constitute a program of rather extensive research in the field of experimental psychology and psychiatry. This resumé concerning the "frontiers of ignorance" is the underlying

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raison d' etre of the present study. It gives the stimulus to the inquiry that is outlined in the next section, which proposes to answer some of the questions that were brought to the fore.

C. Aim of Present Study

It would be an Herculean task to attempt a reply to all the questions raised in the last as well as in the previous sections. In the present study, we shall attempt to answer or "settle" a number of those problems - not all of them. Our interest concentrates, largely, around the dementia praecox and manic-depressive groups, since these are to some extent still terra incognita in the field of psychiatry and some light shed on them would be of great value. Also, according to many authorities the above groups are merely extremes of the normal introversion-extroversion types; since that is the case, our understanding of normals may consequently be increased.

It is, therefore, the aim of this study to investigate the following points:

1. The relationship between age and the present measures of perseveration.

2. A comparison in degree of perseveration between the two psychiatric categories---dementia praecox and manic-depressive psychoses.

3. Comparison, in regard to perseveration, between the sub-groups of dementia praecox (catatonic, hebephrenia, paranoia, et cetera).

4. The degree of perseveration in the two phases (manic and depressive) of the manic depressive psychosis.

5. The relationship between perseveration and introversion -extro-

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5. The relationship between perseveration and introversion-extro-

version.

6. Do the "p" tests measure the same thing?

7. What is the relation between "improvement" and the "p" score?

CHAPTER IV

EXPERIMENTAL METHODS AND PROCEDURES

A. Subjects Used

All the subjects employed in this study were patients taken from the wards of the Boston State Hospital. The management of this hospital extended to the present investigator its hospitality and laboratory facilities. All the subjects were males between the ages of 19 - 60. Many of them were in the wards of the building in which E's laboratory was located, others were brought by an attendant from other buildings, because a "doctor wanted to see them." Some parole patients came over upon request. None of the patients was "forced" in any way.

There were two experimental groups---A and B. Group A consisted of 32 individuals among whom were 22 cases of dementia praecox and 10 cases of manic-depressive (depressive state). The preliminary results are based upon experimentation with this group. (See Chapter V.)

The second group (B) consisted of 80 individuals among whom were 25 manic-depressives (both phases) and the rest were cases of dementia praecox of a great many varieties---catatonics, paranoics, hebephrenics, simple praecoxes and some whose grouping was undetermined. Among this group there was a number of individuals (10) whose cooperation and reliability of report were unsatisfactory, and, therefore, do not count in the final results.

There was also a small number (7) of parole patients in the above group. These patients were quite well oriented and were taking care of themselves quite well. They were allowed to move freely on the hospital grounds.

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There was also a small number (7) of psychotic patients in the above group. These patients were quite well oriented and were taking care of themselves quite well. They were allowed to move freely on the hospital grounds.

The cases were looked up in the hospital files, with an eye for unusual diagnosis and elimination of complicating factors like brain

injury, arteriosclerosis, symptoms of senility, organic changes, alcoholism and the like. In other words, the desire to try to get "clear-cut" diagnostic groups was dominant in the choice of the subjects. Also, an approximate matching of ages between the praecoxes and depressives was kept in mind.

B. The Preliminary Rapport

The author felt that with the type of subjects used in this study, the establishment of some sort of rapport was an essential part of the experimental technique and procedure. Since the battery of tests was not completely of the "objective" type in which the cooperation and report of the subect was not essential, this rapport was quite necessary. E tried to overcome the following attitudes which are typical of a great many hospitalized psychotic patients:

1. Fear of doctors, E being considered one of them in general; (injections, et cetera.)

2. Fear as part of paranoid, psychotic delusions---"someone is going to put something over on them."

3. Resentment of suspicion that there is something wrong with them. They need no treatment; they "don't want to be touched;" "they are perfectly all right physically and mentally."

4. Fear of instruments---especially electrical.

The attitudes listed above are but a few of the most common ones. Each patient may also have some pet aversions and fears which are none to conducive to regular experimental procedure. In order to overcome the obstacles of the nature described above, it was necessary to introduce a

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preliminary conversational period with the patient, preceding the actual experimental procedure and the administration of the tests.

When S is first admitted to the laboratory room, the apparatus cannot be readily seen, (behind screen) and he is invited to sit at the table at which E is seated. The E begins some sort of conversation with S. The conversation does not follow any definite routine, but includes the following items: - length of hospitalization; subject's relatives and their visits; his occupation, or lack of it, on the hospital grounds; educational and economic history; and, if the subject is sufficiently recovered, possibilities of his dismissal from the hospital. If S is talkative, he is permitted to talk and lead to different subjects for a period of fifteen minutes; if he is not talkative, many questions are asked in a casual and none too insistent manner. During this preliminary period E manages (in most cases) to establish some favorable attitudes or overcome negative tendencies, wholly or in part, characteristic of the tested patient.

For some very depressed patients it is necessary to change the mode of response. For instance, instead of expecting a very depressed patient to say, "I feel it now," he is told to take his hands off the chair (electrodes) as soon as he "feels the tingle." Likewise, in the adaptation experiment, after no verbal response is elicited, S is instructed to tap on the table "as soon as he sees the round spot of light." Thus the expected measurement is determined (i.e., adaptation time), though the customary verbal, introspective report is not used. Quite often it was necessary to take numberous measures in order to determine the subject's true adaptation time.

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In the motor tests, tremors, lack of motor coordination, inability to perform delicate movements due to brain injury or other organic reasons, as well as imappropriate comprehension of instructions, hindered in obtaining adequate results in one hundred per cent of the cases. Only the "sure" tests were used in the results; the doubtful material was altogether eliminated. Hence, there is a number of subjects who have satisfactorily completed one or more tests, but not the entire battery; this will be adequately taken into account in the discussion of the results. (See Chapter V).

C. Tests Employed in Study

In order to test the intragroup correlation of the sensory and motor tests and their intergroup correlation with one another, the two traditional types are represented in this study. Two of the most representative motor and two of the sensory tests were chosen. There is no particular justification for the particular choice in each case, except for the fact that from the point of view of the experimenter's experience they would lend themselves to fairly good application with the subjects (psychotics) who were to be used. Other tests were also used (See Section, 3,4) with smaller groups of patients, since excellent cooperation and achievement in all the tests was hardly to be expected.

1. Motor Tests

Both of these tests were used in Stephenson's[1] studies with psychotics. However, there are some modifications here, in the manner of perseveration

1 W.Stephenson, "Studies in Experimental Psychiatry: III. p.-score and inhibition for High p.-Praecox Cases," Journal of Mental Science, 1932, 78, 908-920.

In the motor tests, tremors, lack of motor coordination, inability to perform delicate movements due to brain injury or other organic reasons, as well as inappropriate comprehension of instructions, hindered in obtaining adequate results in one hundred per cent of the cases. Only the "pure" tests were used in the results; the doubtful material was altogether omitted. Hence, there is a number of subjects who have satisfactorily completed one or more tests, but not the entire battery; this will be adequately taken into account in the discussion of the results. (See Chapter V).

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1. Motor Tests

Both of these tests were used in Strauss's[1] studies with psychotics. However, there are some modifications here, in the manner of presentation

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1 V. Strauss, "Studies in Experimental Psychiatry: III. p.-score and inhibition for mild p.-tremor cases," Journal of Mental Science, 1932, 78, 808-820.

and in the methods of scoring[2] for which we found ample justification. The experimental period for the entire test was shortened in agreement with Cattell who considers the "....optimum length for an adult "p" test is one and one-half to two minutes...."[3]

The two motor tests were as follows:

a. Reverse-Stroke Z-test

After S is seated at the table, near E, he is asked the following question: "You know how to make a Z, like this (E writes letter Z similar to a printed one) don't you?" After the subject answers in the affirmative and sees E making the letter, he is given the pencil and is told, "Now, you make one like this."* After S has done as instructed, E continues the instruction as follows:

(1) "Now, when I say 'go,' start making as many of these letters as fast as you can, until I say 'stop.' (Time allowed - 30 seconds). Then, E says: "That is fine, now, we shall make the letter Z the way it would appear in the mirror, like this (E writes letter down)." S follows instructions and writes letter down. Then, the following instructions are given:

(2) "Now, when I say 'go' start making these letters as fast as you can, until I say 'stop.'" (60 seconds). After this activity E proceeds by saying, "Now, we shall alternate these letters---first a regular Z, then a reversed one, like this." S writes down one part. The instructions then follow:

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[2] See Section E, this Chapter.

[3] R.B.Cattell, "On the Measurement of 'Perseveration,'" British Journal of Educational Psychology, 1935, 5, 90.

*See Figure 1, page 52.

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The experimental period for the entire test was shortened in agreement with Cattell who chosen the "....optimum length for an adult 'g' test as one and one-half to two minutes...."[2]

The two motor tests were as follows:

a. Average-Stroke E-Test

After S is seated at the table, near E, he is asked the following question: "You know how to make a E, like this (E writes letter E slightly to a rotated one) don't you?" After the subject answers in the affirmative and sees E making the letter, he is given the pencil and is told, "Now, you make one like this." After S has done so instructed, E continues the instruction as follows:

(1) "Now, when I say 'go,' start making as many of these letters as fast as you can, until I say 'stop.'" (Time allowed - 30 seconds). Then, E says: "That is fine, now, we shall make the letter E the way it would appear in the mirror, like this (E writes letter down)." S follows instructions and writes letter down. Then, the following instructions are given:

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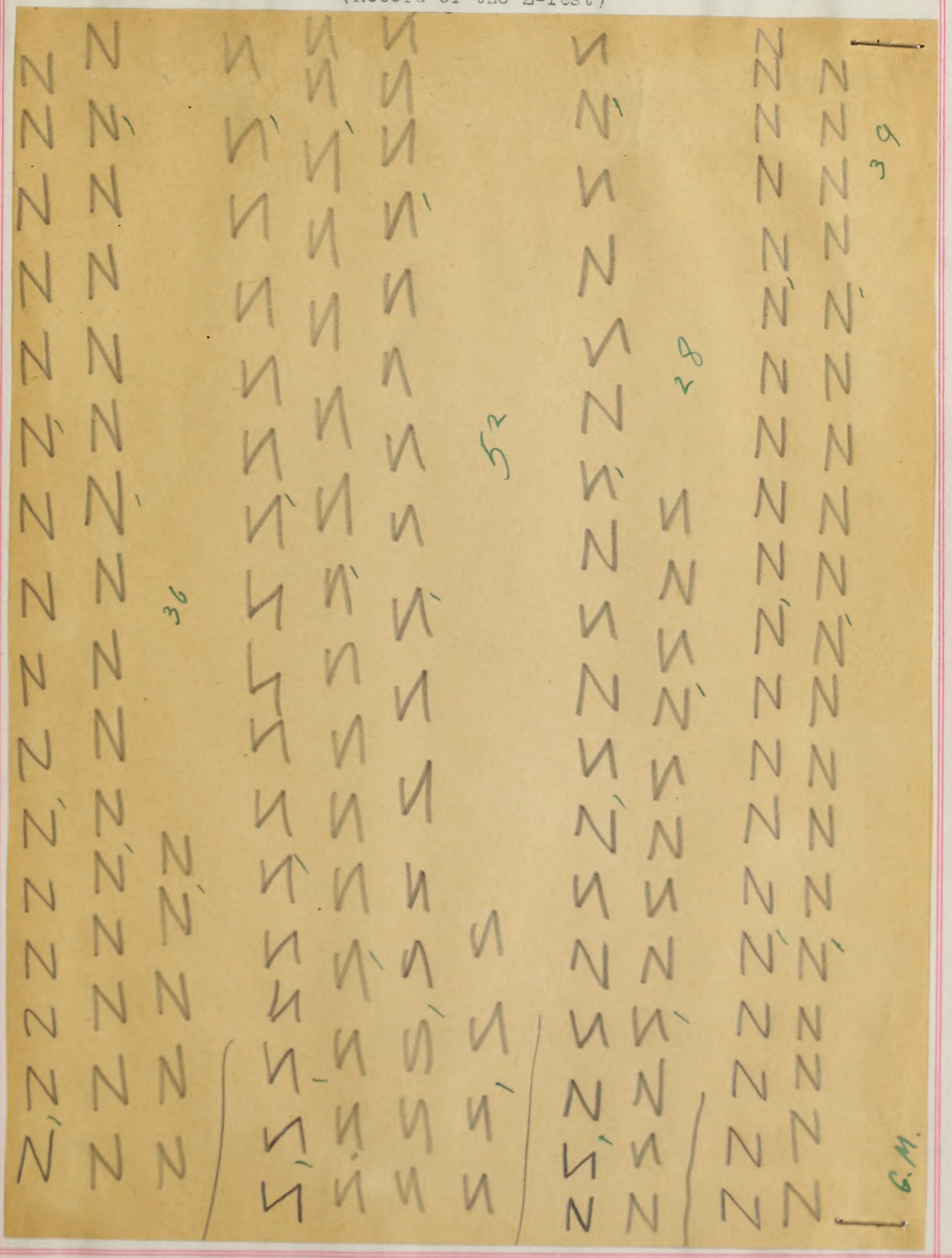
[2] See Section X, this chapter.

[3] R.B.Cattell, "On the Measurement of 'Intelligence,'" British Journal of Educational Psychology, (1932, 2, 90.

See Figure 1, page 55.

FIGURE 1.
(Record of the Z-Test)



(3) "When I say 'go,' start alternating them until I say 'stop.' Go as fast as you can." (30 seconds).

(4) "We shall now make regular Z's again, like the ones we did at first. Go as fast as you can. (30 seconds).

There are intervals of 10-15 seconds between each activity period. Thus, the four activity periods (3), 60, 30, 30 seconds) and the intervals last approximately 3-4 minutes altogether. Prolonged intervals are not desirable, since they may eliminate the effect of the perseverative tendency. Period (1) is only used as a "warming up" period, while the identical activity in (4) is actually used in the scoring.

b. The Grouped Stroke Test

The procedure in this test is quite similar to that in the "Z" test. There are four experimental periods as in the previous one. Each of these lasts 30 seconds. The intervals are the same as in the "Z" test. The instructions for the first activity are as follows:*

(1) "We shall now write three short strokes and a long one, like this, (E writes three short vertical strokes and a long vertical stroke that follows) then, "Now you make one like it. When I say 'go' you will start making many of them, one after the other, until I say 'stop.' (30 seconds).

The instructions for parts (2), (3), and (4) follow the same trend as those in the first motor test.

2. Sensory Tests

The first of these tests is, in principle, similar to the ones used by Wiersma, Jones and other investigators. We made use of some improvements

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* See Figure 2, page 55.

(3) "When I say 'go,' start alternating them until I say 'stop.' Do as fast as you can." (30 seconds).

(4) "You shall now make regular 'x's. Again, fill the cones as fast as first. Go as fast as you can. (30 seconds).

"There are intervals of 15-15 seconds between each activity (pause). The four activity periods (1), (2), (3), (4) are each a 1 minute test administered 5-6 minutes apart. Production totals are not tabulated, also, they may indicate the effect of the preceding exercise. Period (1) is only used as a warming up period, while the additional activity in (4) is optional and is the exception.

4. The Original Stroke Test

The procedure in this test is quite similar to that in the "Z" test. There are four consecutive periods in it as previous one. Each of them lasts 30 seconds. The materials are the same as in the "Z" test. The instructions for the first activity are as follows:"

(1) "We shall now write three short strokes and a long one. After this, I write three short horizontal strokes and a long vertical stroke (and follows) then. Then you make one like it. When I say 'go' you will start making many of them, one after the other, until I say 'stop.' (30 seconds).

The instructions for parts (2), (3), and (4) follow the same trend as those in the first motor test.

5. Geometry Tests

The first of these tests is, in principle, similar to the one used by Binet, Jones and other investigators. We made use of some improvements

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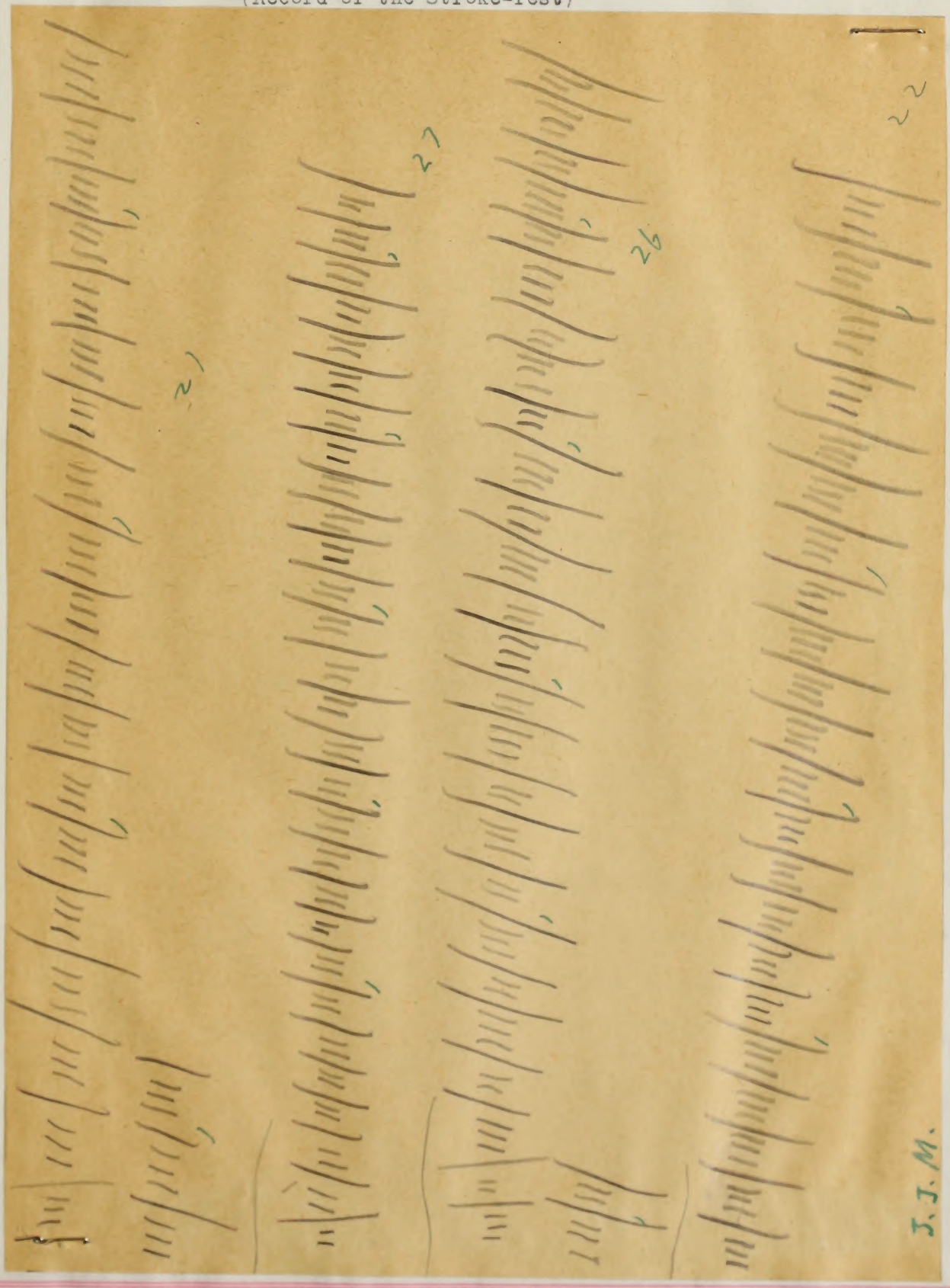
* See Figure 2, page 25.

FIGURE 2.
(Record of the Stroke-Test)



in technique suggested by Shevach.[4]

The second test is, in some respects, an improvement on the methods previously used since the set-up of the machine (Polysine generator) is a very convenient means of gradating the stimuli.

a. Light Adaptation Test

A round hole (1.5 inches in diameter) was cut through a large, closed paper box, suspended from the ceiling. A 7.5 Watt, 115 volt General Electric bulb, wrapped in dark cloth was set up inside the box in a socket and connected with the house source of electric current. The hole which was high enough from the floor to be in the line of vision of an individual seated on a chair, was covered tightly with two sheets of typewriting paper. The subject was seated at a distance of four feet from the box. Suspended from the ceiling and above the line of vision of S was a 250 Watt bulb. The light was reflected upon the white paper covering the hole and was screened off on the other sides. The room was converted into a dark room.

After all the lights, but one, have been put out, the following instructions are given to S:

"Look straight ahead of you, on the white paper; I am going to put out the light. As soon as you see a round spot of light on the paper, you will tell me; the spot may not be very clear, but you will see it."

The lights are put out and E waits until S responds in the darkness. No measurements are taken at this point, since this adaptation is uncontrolled.

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[4] B.J.Shevach, "Studies in Perseveration VI. Methods for the Study of Sensory Perseveration," The Journal of Psychology, 1936, 3, 388.

is technique suggested by Jaynes.[4]

The second test is, in some respects, an improvement on the methods previously used since the set-up of the machine (locating parameters) is a very convenient means of producing the stimuli.

a. Light Detection Test

A round hole (1.5 inches in diameter) was cut through a large, closed paper box, suspended from the ceiling. A 7.5 watt, 115 volt general electric bulb, wrapped in dark cloth was set up inside the box in a socket and connected with the house source of electric current. The hole which was high enough from the floor to be in the line of vision of an individual seated on a chair, was covered tightly with two sheets of tracing paper. The subject was seated at a distance of four feet from the box. Suspended from the ceiling and above the line of vision of S was a 200 watt bulb. The light was reflected upon the white paper covering the hole and was screened off on the other sides. The room was converted into a dark room.

After all the lights, but one, have been put out, the following instructions are given to S:

"Look straight ahead of you, on the white paper; I am going to put out the light. I am going to put up a round spot of light on the paper, you will tell me, the first may not be very clear, but you will see it."

The lights are put out and S waits until a response in the darkness. No measurements are taken at this point, since this adaptation is unconditioned.

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[4] J. Jaynes, "Studies in perceptual-motor vi. Method for the study of memory reinvestigation." The Journal of Psychology. 1956, 3, 255.

As soon as S responds, the 250 Watt light, only, is turned on for 60 seconds, the subject is, then, given the same instructions as above. The stop watch is started the moment the light is put out and is stopped the moment S responds by saying that he sees the "round spot of light." The lapsed time is the adaptation time. This procedure is repeated three times and three measurements are obtained.

b. Electrical Sensitivity Threshold

A MacIntosh[5] Polysine Generator was used in determining the threshold for electrical stimulation of the skin. The subject is seated on a comfortable chair upon the arms of which the metal electrodes, to which the current from the machine is conducted, are attached. S places the index finger (beyond last joint) upon the electrodes on both sides of the chair. The dial of the machine is adjusted for an interrupted galvanic current (80 shocks per minute.) Before the switch is turned, S is instructed as follows:

"Put your fingers on here, like this (E helps S). Now, you will tell me as soon as you feel the slightest tingle in your fingers."

Then the current dial of the apparatus is slowly moved along the 0-180 milliampere scale until the instructed subject responds.

This procedure is repeated three or more times in order to get a consistent and reliable measure, which is the number of degrees traversed by the pointer of the dial on the milliampere scale.

3. A Test of Rhythmic Perseveration

In this test the process of hand-ear coordination is involved. A rubber tube closed on all sides and connected with a pneumatic recording

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[5] G.A.Remington, Gleanings of Low Voltage Techniques, 1930.

As soon as 5 seconds, the 250 watt light bulb is turned on for 60 seconds. The subject is, then, given the same instructions as above. The stop watch is started the moment the light is put out and is stopped the moment 2 responds by saying that he sees the "round spot of light." The lapsed time is the acceptance time. This procedure is repeated three times and three measurements are obtained.

b. Electrical Sensitivity threshold

A Medicaid[5] Polyrate Generator was used in determining the threshold for electrical stimulation of the skin. The subject is seated on a comfortable chair upon the arms of which the metal electrodes, to which the current from the machine is conducted, are attached. S places the index finger (beyond last joint) upon the electrodes on both sides of the chair. The dial of the machine is adjusted for an interrupted galvanic current (60 shocks per minute.) Before the switch is turned, S is instructed as follows:

"Put your fingers on here, like this (E helps S). Now, you will feel me as soon as you feel the slightest tingle in your fingers."

Then the current dial of the apparatus is slowly moved along the 0-150 milliampere scale until the instructed subject responds.

This procedure is repeated three or more times in order to get a consistent and reliable measure, which is the number of degrees traversed by the pointer of the dial on the milliampere scale.

3. A Test of Auditory Perseveration

In this test the process of mental-set conditioning is involved. A rubber tube closed on all sides and connected with a pneumatic recording

5 G.A. Zemlanos, Dissenses of low Voltage Techniques, 1950.

set-up is presented to the subject. Only the piece of tubing is visible to the subject in front of the screen behind which the rest of the apparatus is to be found. The subject is instructed to press the tube once for every tick he hears. The metronome is then released and E shows the subject how to press it "as fast as the ticks are coming." S begins to press the tube, the stopwatch is started, and thus the actual experiment begins. The experimental period is divided into four parts.

(1.) Part one lasts for 30 seconds - from the subjects's first exerted pressure till 30 seconds have passed and, at that point the kymograph* is started.

(2.) Part two also lasts 30 seconds, after the kymograph runs for half a minute the electric key is pressed and the metronome speed is suddenly increased from 110 to 170 beats per minute.

(3.) Part three, with a fast metronome only, lasts for 15 seconds, since only the transfer from one speed to the other is the crucial point. At the end of the period, the metronome is stopped.

(4.) Period four is not really a part of the true experimental procedure, neither has it definite time limits. E observed that some patients keep on pressing the tube even after the metronome has stopped. Apparently some of the subjects become conditioned to the noise made by the kymograph which is not usually stopped simultaneously with the metronome. Some patients, however, continue pressing the tube even after both the metronome and the kymograph have been stopped. Moreover, a silenced kymograph does not eliminate these after-effects in some individuals.

During the first and second periods which last together for one

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* See Kymographic records, p. 59.

set-up is presented to the subject. Only the blade of tubing is visible to the subject in front of the screen behind which the rest of the apparatus is to be used. The subject is instructed to press the tube once for every tick he hears." The metronome is then released and I shows the subject how to press it "as fast as the ticks are coming." I begins to press the tube, the stopwatch is started, and thus the actual experiment begins. The experimental period is divided into four parts.

(1.) Part one lasts for 60 seconds - from the subject's first marked pressure till 60 seconds have passed and, at that point the kymograph* is started.

(2.) Part two also lasts 60 seconds, after the kymograph runs for half a minute the electric key is pressed and the metronome speed is suddenly increased from 110 to 170 beats per minute.

(3.) Part three, with a fast metronome only, lasts for 15 seconds, since only the transfer from one speed to the other is the crucial point. At the end of the period, the metronome is stopped.

(4.) Period four is actually a part of the main experimental procedure, neither one is definite time limits. I observed that some patients keep on pressing the tube even after the metronome has stopped. Apparently some of the subjects become conditioned to the noise made by the kymograph which is not usually stopped simultaneously with the metronome. Some patients, however, continue pressing the tube even after both the metronome and the kymograph have been stopped. Moreover, a slanted kymograph does not eliminate these after-effects in some individuals.

During the first and second periods which last together for one

* See kymograph records, p. 38.

FIGURE 3.

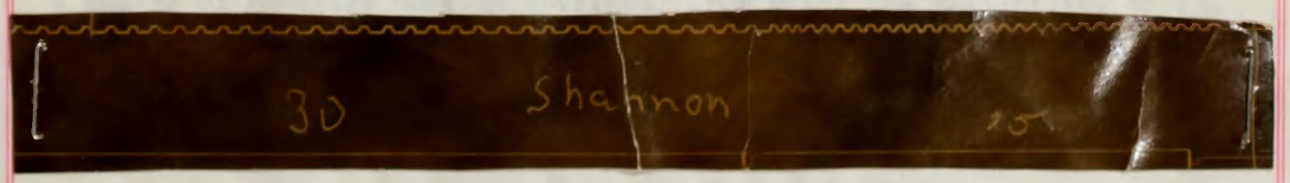
Kymographic Record of the Test of Rhythmic Perseveration

(A "No Change" Patient)

FIGURE 4.

Kymographic Record --- Rhythmic Perseveration

(A "Change" Patient)



minute S gets used to a definite rhythmical activity (hand-ear) coordination at definite intervals. When the metronome speed is suddenly increased S "perseverates" and continues his previous activity for a small fraction of a minute until he completely adjusts himself to the new rhythm. The time utilized for the adjustment to the new rhythm and for the overcoming the tendency to preserve the old one is called the perseveration time. It is not measured in seconds, but in terms of the large waves traced from the moment of change on the kymograph which are shortly followed by the small waves which represent the new and faster rhythm.

D. Critique of Subjects' Reports (Reliability)

The report of psychotic subjects is not to be accepted naively, without any criticism. It must be stressed that E must make sure that S understands fully the instructions, but, this is not sufficient. It is necessary to focus S's attention upon the task (i.e., report et cetera) at hand. To some extent a tension and feeling of "need" to report must be created in the subject. In most cases it is fairly easy for E, after some experience, to identify the report, upon which the subject concentrated well. In the case of "adaptation to light" and "electrical sensitivity" a number of readings must be obtained, from which the reliability of the report can be deduced. When E felt that the value of the results of some test was impaired by lack of sufficient concentration on the part of S or by his excessive suggestibility, the results of that particular test were not used in the final computations. Thus, much of the work had to be discarded and consequently, the number of cases reduced, in accordance with this procedure. No unfair sampling was introduced as a result of this

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ction at definite intervals. When the metronome speed is suddenly
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coming the tendency to preserve the old one is called the perseveration
time. It is not measured in seconds, but in terms of the large waves
traced from the moment of change on the kymograph which are shortly
followed by the small waves which represent the new and faster rhythm.

C. Criticism of Subjects' Honesty (Reliability)

The report of psychotic subjects is not to be accepted naively,
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understands fully the instructions, but, this is not sufficient. It is
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discarded and correspondingly, the number of cases reduced, in accordance with
this procedure. No untoward sensitive was introduced as a result of this

procedure, since there was no predominace of one diagnosis or another in the eliminated group. Suggestion played an important part in the experiment on electrical sensitivity when the subject felt a "tingle" even before the current was turned on. E. purposely asked for reports when there was no current passing in order to check the value of S's responses. A similar situation prevailed in the adaptation test, though it was more difficult to check the reliability of the reports.

In the other tests no such difficulties were noticed, since the results are dependent upon one's behavior and performance rather than "introspective" reports. No doubt, however, that even here, fluctations in attention and in volition played an important and, at times, a vitiating role.

E. Methods of Scoring

The motor tests were scored, previously, in a number of different ways. The following are the different activities involved in each of the motor tests:*

X_1 - Habituated activity for 30 seconds (regular "Z's" (a) three short strokes and a long one).

Y - Different but similar activity for 60 seconds (reversed Z's and two short strokes and a long one).

Z - Alternation of habituated and different units for 30 seconds.

X_2 - Repetition of X_1. Each activity in the first motor-test (2) has its parallel in the second motor test (grouped strokes).

Previous methods of scoring as reviewed by some investigators[6]

[6] W.Stephenson, "An Introduction to So-Called Motor Perseveration Tests," British Journal of Educational Psychology, 1934, IV, 186-207.

*The letters X,Y,Z refer to the amount of output in each period.

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Previous methods of scoring as revealed by some investigators[6]

[6] R. Stephenson, "An Introduction to So-Called Motor Perseveration Tests," British Journal of Educational Psychology, 1934, IV, 164-207.

*The letters X,Y,Z refer to the amount of output in each period.

possessed many masking factors. For instance, a scoring equivalent to $X + Y - 2Z$ will give too much weight, in the "p" score, to the speed in the performance of the subject. Also, $\frac{2X}{YZ}$ gives undue weight to the "different but similar activity" in which the difficulty is more of learning the new mode of response, rather than in the interference of perseveration.

The rationale of the present scoring follows a different path. The X_1 activity is considered as a "warming up" activity, not be counted in calculating the final score. Then, in Z-activity (alternation), if there were no perseveration at all, the number of letters written would be equal to half the number written in X_2 plus one fourth the number written in Y (since there a 60 second period is allowed). In other words, there being no perseveration $Z = \frac{X}{2} + Y/4$ or $2Z = X + \frac{Y}{2}$.

However, Z is usually smaller on account of "p" in the alternating activity; then, the number of units lost due to perseveration will equal to $X + \frac{Y}{2} - 2Z$ or $2X + Y - 4Z$.

However, this alone will give us a quantity, not related to the speed of the individual will be the adequate "p" score. Hence we have $\frac{X + Y/2 - 2Z}{X \quad Y/2}(100)$ as the "p" score; i.e., the ratio between the units (letters or groups of strokes) lost due to "interference." This method of scoring was employed in the preliminary results present in the present study. It is noteworthy that when this method is used, negative scores[7] (due to a larger 2Z value than $X + Y/2$) are obtained. Such scoring is undesirable for a number of statistical and theoretical reasons.

A different method of scoring was applied to the results of the

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[7] See Chapter VI, present study.

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A different method of scoring was applied to the results of the

[7] See Chapter VI, present study.

final study. In order to deal largely with positive scores and provide for simpler calculations, an output ratio is set up in which the habitual regular output is put over the alternating activity which is to reveal perseveration. The ratio is as follows: $\frac{X+Y/2}{2Z}$. If the person is a great perseverator he will have many fewer units in his "Z" output than in either "X" or "Y"; thus, the ratio will be larger; consequently, the "p" score will also be larger. This ratio is multiplied by 100 in order to avoid dealing with fractions in the frequency distribution and in the conclusions.

Scoring the adaptation test was quite simple---the mean of the last two measures of time necessary to see the "round spot" was used as the final score. The assumption here is, as it has been in previous experiments,[8] that the longer the after-function or after-sensitivity, the greater is the "Sekundaerfunction" (secondary function) or perseveration.

The strength of current necessary to "just feel a tingle" was taken also as a measure of the subject's perseveration. Here too, the average of the last two readings was taken as the final score. The basic idea behind this is that inertia is a property of states of rest as well as of motion; the higher perseverator would have a higher threshold for any sensitivity. His inertia (i.e., perseveration) is that of maintaining a state of rest despite disturbances. However, when stimulation is strong enough, this "inertia" is overcome, the subject then "feels" the stimulation. The point at which the liminal stimulation begins is a measure of perseveration, since up to that point the inertia or perseveration of rest is maintained.

In the case of "rhythmic perseveration," the time that lapses until

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[8] See Chapter II, present study.

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In the case of "rhythmic perseveration," the time that lapses until

[5] See Chapter II, present study.

adjustment to the new rhythm of the metronome takes place is considered as a measure of perseveration. However, that time cannot be measured in any other manner except in terms of distance traversed on the smoked drum of the kymograph. Every pressure exerted by S on the tube, records a long wave on the kymograph drum. The waves of the first 30 seconds are somewhat larger (slower metronome) than the ones in the following 15 seconds (faster metronome). The smaller waves appear shortly after the speed has been changed. A few large waves still persist. Hence E measures by means of dividers the length of the first five waves (apt to include the few persisting from the previous rhythm) and then, the length of the last five waves in the 15 second period. The ratio between the former (supposed to be larger) and the latter gives an index of perseveration.

The final score is calculated in the following manner:

$$\frac{L_1}{L_2} \times 100 = P.$$

L_1 is the length of the first five waves immediately after the change of speed of the metronome; L_2 is the length of the last five waves of that fast metronome 15 second period---P is the final score.

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CHAPTER V

EXPERIMENTAL RESULTS

A. Preliminary Results

The aim of the study was much more circumscribed during the preliminary period of experimentation. E was interested in determining the difference between the two groups and the intercorrelation of the tests employed. The picture presented itself in a manner somewhat different than it appeared in other investigations. The table below gives us the means of the scores of four tests* for the two diagnostic groups.

TABLE VI

Mean P-Scores in Cases of Dementia Praecox and Manic-Depressive

Diagnosis	Z-test	Strokes	Elect. Sensit.	Adapt.	Age
Dementia Praecox	23.1	-2.0	56.9	15.0	42.4
Manic Depressive	24.2	15.1	63.0	20.2	33.1
D/PE_D	.27	31.9	2.50	1.24	
Chances in 100	57	98	95	80	

There appears to be a definite trend, on the basis of these data, towards higher perseveration among the depressives and lower among the praecoxes. Of course, in case of the Z-test and the adaptation test, the differences appear very small and insignificant. However, in the other tests they are of considerable magnitude (grouped strokes, stimulation). Another interesting fact was simultaneously revealed; the mean age of the

*Also the "it" test was used; too little data prevented its inclusion.

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CRD	.27	31.2	3.50	1.24	
Cases in 100	37	38	33	20	

There appears to be a definite trend, on the basis of these data, towards higher perseveration among the dementives and lower among the manicdepressives. Of course, in case of the Z-test and the adaptation test, the differences appear very small and insignificant. However, in the other tests they are of considerable magnitude (prolonged stroops, stimulation). Another interesting fact was simultaneously revealed; the mean age of the

*Also the "it" test was used; too little data prevented its inclusion.

of the praecox group was nine years higher than that of the manic-depressive group. The question arose, therefore, whether the differences between the means of the two groups are actually due to the differential diagnosis or to a possible correlation, negative or positive, between the tests and the age of the subjects. All the tests were, therefore, correlated with age. The rank-difference method was used in all correlations of the preliminary results.

The table below shows us the correlations of each test with age. Among these coefficients of correlation, the first one (adaptation) is the only significant one; its probable error being .099, less than one fourth its own magnitude.

TABLE VII

Preliminary Correlations of Tests with Age.

Light Adaptation	Electrical Stimulation	Z-Test	Strokes
.43	.27	-.26	-.31

The other coefficients of correlation are much less than four times their probably errors. Hence, the only significant correlation is a positive one, and if anything, it would reduce still more the adaptation score in the case of the dementia praecox group, taking age into account, and thus, accordingly increase the difference between the latter group and that of manic-depressive.

The intercorrelation of the tests presented a case for the separation of the motor from the sensory tests. The correlation between the two motor

of the primary group was nine years higher than that of the manic-depressive group. The question arose, therefore, whether the difference between the means of the two groups are actually due to the differential diagnosis or to a possible correlation, negative or positive, between the tests and the age of the subjects. All the tests were, therefore, correlated with age. The rank-difference method was used in all correlations of the preliminary results.

The table below shows us the correlations of each test with age. Among these coefficients of correlation, the first one (adaptation) is the only significant one; its probable error being .029, less than one-fourth its own magnitude.

TABLE VII

Preliminary Correlations of Tests with Age.

Adaptation	Electrical Stimulation	Z-Test	Strokes
.23	.27	-.26	-.21

The other coefficients of correlation are much less than four times their probable errors. Hence, the only significant correlation is a positive one, if anything. It would reduce still more the adaptation score in the case of the dementia praecox group taking age into account, and thus, accordingly, increase the difference between the latter group and that of manic-depressive.

The intercorrelation of the tests presented a case for the separation of the motor from the sensory tests. The correlation between the two motor

tests (Z and grouped stroke) was a rather significant one; it was a positive correlation of .51 with a P. E. of .095. Thus it appears that there definitely is a linkage between the two tests measuring a like factor.

The correlation between the adaptation test and that of electrical liminal sensitivity was positive, but rather low (.27) and not quite four times its P. E. One may thus presume a weak factor of sensory perseveration.

A more important discovery, however, was the negligible relationship between the motor and sensory tests. For instance, the positive coefficient of correlation between the Z-test and that of adaptation was .01. It was, therefore, necessary to conclude, tentatively, on the basis of these results, that the sensory tests used may not measure perseveration at all. They may measure the reaction-time of the subjects or their ability to follow instructions, rather than the perseverative tendency. Or, if there are such things as motor and sensory perseveration, some relationship between them ought to be shown in order to permit the common term.

The following problems suggested themselves for further investigation with a larger number of subjects:

1. Is there a difference in perseveration between like age groups of different psychiatric diagnosis?

2. Do we still discern two distinct factors, i.e., motor and sensory perseveration?

3. What age level is responsible for the correlation with age (if present)?

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The results in the next section are attempts to solve these problems.

B. Further Results

The tables (VIII, IX, X, XI, on pages 69, 70, 71, 72) are compiled on the basis of the results obtained from the second experimental group (B).

Table VIII shows, as far as age is concerned, the reverse condition from what is obtained in Table VI. Here the mean age of the manic-depressives is higher than that of the dementia praecox cases. The other conditions, however, remain approximately the same, that is, the scores of the dementia praecox patients in all tests are lower than those of the manic-depressives. A truly significant difference exists, perhaps, in the case of the Z-test (91 chances in 100); the reliability of the other differences, though pointing in one direction, is not great enough to serve as a basis for certainty and conclusiveness. Of course, in both cases (of preliminary and present results) only the depressive-phase patients were used in the comparison.

Tables IX, X, and XI give us the further opportunity to analyze the scores within the general praecox group; groups of patients of the same number, whose mean age was approximately the same, were matched. There, the catatonic group, seems to be definitely higher in three of the tests, than either group of paranoid praecoxes and the "others" (hebephrenics and simple) group. This was further substantiated (though not perfectly) after the significant ratios had been computed. The differences between the means of the catatonic group and each of the others is of considerable significance, at least in two tests (Strokes and adaptation). Obviously, the differences between the paranoid and "others" group is of no significance. The dementia praecox paranoid group seems to be lowest in the general praecox group in regard to the adaptation and electrical sensitivity tests. Otherwise, there is little difference between the two groups (paranoid and others).

Further Results

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TABLE VIII

MEANS OF P SCORES FOR DEMENTIA PRAECOX AND MANIC-DEPRESSIVE CASES

	Dementia Praecox	Manic Depressives	$\frac{D}{PE_D}$	CHANCES IN 100*
Age	35.2	40.2		
Z-Test	118.5	130.5	2.00	91
Strokes	110.8	114.7	.86	72
Adaptation	44.9	51.4	1.16	78
Electrical Stimulation	61.8	64.7	1.02	75

*Number of chances in 100 that the obtained difference is significant (that a true difference exists).

TABLE VIII

MEANS OF F-SCORES FOR DEMENTIA PRAECOX AND MANIC-DEPRESSIVE DATES

	Dementia Praecox	Manic Depressives	$\frac{D}{MD}$	CHANCES IN 100*
Age	52.2	40.2		
S-Test	116.3	180.3	2.00	71
Strokes	110.8	144.7	.88	72
Adaptation	44.2	31.4	1.16	78
Electrical Stimulation	81.8	64.7	1.02	75

*Number of chances in 100 that the obtained difference is significant (that a true difference exists).

TABLE IX

P-Scores of Catatonics and other Praecox Cases

	Catatonics	Others	$\frac{D}{PE_D}$	Chances in 100
Age	35.7	36.1		
Z-Test	124.7	112.3	1.89	90
Stroke	129.7	111	2.93	97
Adaptation	60.6	36.6	3.58	99
El. St.	68.	60.3	1.60	86

TABLE IX

T-Scores of Dextrorts and other Frenzos Cases

	Dextrorts	Others	$\frac{D}{P.E.D.}$	Changes in 100
Age	35.7	36.1		
S-Test	124.7	124.3	1.23	30
Stroke	123.7	111	3.33	97
Adaptation	40.8	36.6	3.86	99
Mi. Sy.	58.	60.5	1.60	86

TABLE X

P-Scores of Catatonics and Paranoiacs

	Catatonics	Paranoiacs	$\frac{D}{PE_D}$	Chances in 100
Age	35.7	35.7		
Z-Test	124.7	117.7	1.10	77
Stroke	129.7	110.7	3.16	98
Adaptation	60.6	31.1	4.35	100
El.St.	68.0	60.3	1.52	84

TABLE XI

P-Scores of Paranoiacs and "Others"

	Paranoiacs	Others	$\frac{D}{PE_D}$	Chances in 100
Age	35.7	36.1		
Z-Test	117.7	112.3	1.33	82
Strokes	110.7	111	.08	52
Adaptation	31.1	36.6	1.55	85
El. St.	60.3	60.3		50

In Table XII on page 74, the manics are compared with the depressives, there are no significant differences in the scores of the Stroke-test and that of electrical sensitivity, but the differences on the other two tests are of considerable magnitude and the chances are 99 in 100 that a true difference exists.

The next table (XIII), on page 75, gives a complete picture of the intercorrelations* of the various tests with each other and with age. Except for the test of electrical sensitivity (in this case the correlation is significant), age plays a small role in modifying the "p" score of individuals. There is a slight correlation with age between each of the tests. The next two highest positive correlations are between the two sensory and between the two motor tests respectively. One of the motor tests correlates very slightly, positively with each of the sensory ones, but the other motor tests (strokes) shows a negative coefficient of correlation in both cases.

The results in Tables XIV, XV, on page 76 are rather unexpected. It appears that the scores of the three better intercorrelated tests are much lower for the lowest age group (20-29). The scores then go up and stay up between 30-49 and then are reduced again, at the highest age level (50-59). The differences between the 20-29 and 30-39 groups are quite reliable and significant, showing a definite trend upward, beyond the 30 year level. The reduction of the scores at the highest age-level (50-59) is less marked and not quite so significant.

The table below, (XVI) gives the mean results obtained for a group of partly recovered patients. The improvement was determined by the subject's

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TABLE XII

A COMPARISON BETWEEN MANIA AND DEPRESSION IN REGARD TO PERSEVERATION

	Manics	Cases of Depression	$\frac{D}{PE_D}$	Chances in 100
Age	34.5	35.5		
Z-Test	119.3	152.3	3.55	99
Stroke	109	107.8	.29	58
Adaptation	39.3	64.9	3.46	99
Electrical Stimulation	65.1	58.8	1.26	80

TABLE XII

A COMPARISON BETWEEN MANIA AND DEPRESSION BY REGARD TO PERSEVERATION

	Means	Cases of Perseveration	$\frac{D}{PED}$	Chances in 100
Age	34.5	33.5		
B-Tests	113.5	142.5	3.55	.99
Strokes	109	107.5	.29	36
Adaptation	23.5	24.5	3.16	39
Electrical stimulation	66.1	54.5	1.76	40

TABLE XIII

CORRELATIONS BETWEEN THE TESTS

	Age	Adapt. to Light	Elect. Sensit.	Z-test	Stroke Test
Age		.122 ±.082	.348 ±.079	.284 ±.083	.113
Adaptation to Light	.122 ±.082		.438 ±.071	.185 ±.089	-.201
Electrical Sensitivity	.358 ±.079	.438 -071		.096 -090	-.209
Z-test	.284 ±.083	.185 -.089	.096 ±.090		.306 ±.085
Stroke-test	.113	-201	-209	.306 ±.085	

TABLE XIII

CORRELATIONS BETWEEN THE TESTS

	Age	Adapt. to Light	Electr. Sensit.	Z-test	Stroke Test
Age		.122 ±.082	.048 ±.079	.264 ±.082	.111
Adaptation to Light	.122 ±.082		.438 ±.071	.188 ±.086	-.201
Electrical Sensitivity	.316 ±.079	.158 -.071		.086 -.090	-.209
Z-test	.084 ±.082	.185 -.089	.084 ±.070		.104 ±.084
Stroke-test	.112	-.201	-.209	.209 ±.085	

TABLE XIV

TEST SCORES FOR YOUNGER AGE-GROUPS

	20-29	30-39	$\frac{D}{PE_D}$	Chances in 100
Z-Test	115.4	127.9	3.90	100
Grouped Strokes	115.4	102.2	2.94	97
Adaptation	34.0	48.2	3.71	99
El. Stim.	52.9	63.2	2.89	97

TABLE XV

TEST SCORES FOR OLDER AGE-GROUPS

	40-49	50-59	$\frac{D}{PE_D}$	Chances in 100
Z-Test	131.1	118	2.27	94
Grouped Strokes	123.0	110	2.57	95
Adaptation	49.4	39.8	2.73	97
El. Stim.	64.0	63.7	.09	52

TABLE IV

TEST DATA FOR WOMEN AGE-GROUPS

	20-29	30-39	$\frac{D}{T^2D}$	Change in 100
X-Test	110.4	127.0	3.90	100
Grouped Strokes	110.4	107.7	3.94	97
Adaptation	84.0	49.7	3.71	59
Gl. Stim.	96.9	83.7	3.69	87

TABLE V

TEST DATA FOR MEN AGE-GROUPS

	40-49	50-59	$\frac{D}{T^2D}$	Change in 100
X-Test	121.1	116	3.27	94
Grouped Strokes	121.0	110	3.37	93
Adaptation	43.4	32.6	3.73	27
Gl. Stim.	84.0	83.7	.09	82

TABLE XVI

P-Scores of Improved Subjects

Z-Test	Stroke	Adaptation	Electrical Stimulation
120	118	37.7	63.9

accessibility as determined by E in cooperation with the attending physician. Some of this group were on parole which is the status nearest to dismissal from the institution.

The only test that shows any definite difference is that of adaptation time. The improved patients present in this one test a much smaller score. In the rest of the tests no great change in "p" is evident when compared with the mean of the entire experimental group.

C. The Test on Rhythmic Perseveration

The subjects were divided into two groups after the results were obtained. Some of the subjects demonstrated no change in their speed of movement (pressing the tube) after the speed of the metronome was altered. The other group showed definite changes in the rhythm shortly after the metronome beats came more rapidly. The individual differences within this latter group are not sufficiently marked nor can they be adequately graded in order to be correlated with the other tests. However, there are some differences between the magnitude of the scores of the subjects who demonstrate no change in rhythm and those who do show the change. In Table XVII (below) we see that in three of the other tests (except adaptation)

TABLE XVI

T-Scores of Improved Subjects

S-Test	Strokes	Adaptation	Electrical Stimulation
120	116	87.7	66.9

accessibility as determined by S in cooperation with the attending physician. Some of this group were on parole which is the status nearest to dismissal from the institution.

The only test that shows any definite difference is that of adaptation time. The improved patients present in this one test a much better score. In the rest of the tests no great change in "p" is evident when compared with the mean of the entire experimental group.

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TABLE XVII

P-Scores for High and Low Perseverators as
Determined by the Test on Rhythmic Perseveration.

No Change				Change			
Z-Test	Strokes	Adapt.	Elect. Stimul.	Z-Test	Strokes	Adapt.	Elect. Stimul.
128	114	41.6	65.3	120	110	45.3	59.7

the mean scores for the "no change" group are higher than for the "change" group.

Much more should be expected from this method with an electrical set-up of more exact recording devices.

TABLE XVII

T-Scores for High and Low Perseverators as
Determined by the Test on Rhythmic Perseveration.

No Change				Change			
T-Test	Strokes	Adapt.	Elect. Stimul.	T-Test	Strokes	Adapt.	Elect. Stimul.
128	114	41.6	25.3	120	110	45.3	39.7

The mean scores for the "no change" group are higher than for the "change" group.

Much more should be expected from this method with an electrical set-up or more exact recording devices.

CHAPTER VI

DISCUSSION OF RESULTS

A. Diagnoses and P-Scores

Our results seem to agree in part with the tables presented by Stephenson.[1] In his results Stephenson establishes the fact that manics are lowest perseverators, while next to them, somewhat higher, are some cases of dementia praecox (low "p"), then still higher perseverators are the manic-depressives, while the highest perseverators are, according to him, a number of praecox cases (high "p"). Our results appear to confirm the fact that the manics are lowest perseverators (with the exception of the test on electrical sensitivity). Next it appears that the manic-depressive group as a whole is consistently higher in every test, both in the preliminary as well as in the final results; the mean age of the manic-depressive's being higher in the preliminary results and lower in in the final ones. This is also quite a different picture from that obtained by Shipley[2] who places the schizophrenic group highest in regard to perseveration. The answer to the obvious inconsistency must be found in the following explanations:

1. The methods were quite different in Shipley's and in Stephenson's work. The former used entirely different tests (psychogalvanic reflex, conditionability, extinction, and others). The latter's manner of combining the scores on the basis of a 20 point scale may have changed the true picture to some extent. No measures of the significance of the difference between the means were computed by either investigator.

2. No differentiations have been made within the dementia praecox group. There may be types of individuals in this group who may bring the score up for the rest of the group.

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[1] See Table III, page 37.
[2] See Table IV, page 40.

. Diagnoses and P-Scores

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1. The methods were quite different in Shipley's and in Stephenson's work. The former used entirely different tests (psychogalvanic reflex, conditionability, extinction, and others). The latter's manner of combining the scores on the basis of a 30 point scale may have changed the true picture to some extent. No measure of the significance of the difference between the means were computed by either investigator.

2. No differentiations have been made within the dementia praecox group. There may be types of individuals in this group who may bring the score up for the rest of the group.

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[1] See Table III, page 37.
[2] See Table IV, page 40.

When we sought to try and distinguish the praecox cases on the basis of the degree of dementia[3] we found that too subjective criteria will have to be used. Hence the more "objective" groupings used in psychiatry were employed. The results show (again, with the exception of electrical stimulation) that within the praecox group, the catatonics show a markedly higher degree of perseveration than do the other two praecox groups. We tried to eliminate the age factor in this comparison in order to make it much more correct. These results, then, may explain Stephenson's "high-p" cases and "low-p" cases. The former may correspond to our catatonic group, while the latter may be characteristic of the paranoid, hebephrenic and simple types of dementia praecox.

Parenthetically, it should be remarked that even the catatonic group does not exceed in all tests the mean score of the depressive-phase psychotics. The results concerning the catatonics seem to be in agreement with those obtained by Mays[4] in his studies.

Therefore, if we were to average up the scores we would be able to show the following sequence in order of increasing perseveration.

1. Manic
2. Dementia praecox paranoids
3. Hebephrenic and simple praecox patients
4. Manic-depressives
5. Catatonics

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[3] W.Stephenson, "Studies in Experimental Psychiatry 11. Some Contacts of p.-factor in Psychiatry," Journal of Mental Science, 1932, 78, 315.

[4] L.L.Mays, "Studies in Catatonia V. Perseverational Tendencies in Catatonic Patients," The Psychiatric Quarterly, 1934, 8, 728.

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h those obtained by Hoye[4] in his study.

Therefore, if we were to average up the scores we would be led to
the following sequence in order of increasing perseveration.

1. Manic
2. Dementia praecox paranoid
3. Hebephrenic and simple dementia praecox
4. Manic-depressives
5. Catatonics

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[3] Stephenson, "Studies in Experimental Psychiatry II. Some Contents
-factor in Psychiatry," Journal of Mental Science, 1932, 78, 216.
[4] I.I.Hoye, "Studies in Catatonia V. Perseverational Tendencies
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B. Interrcorrelation between the Tests

It is no secret that no battery of perseveration tests is near to being standardized. These tests, which have been previously used by other investigators[5], do not appear to intercorrelate well for psychotic subjects. Some better results may be obtained with normal subjects whose greater stability and lesser variability may account for it.[6] The lack of significant correlations between the tests in psychotic subjects does not cast any reflections upon the validity and reliability of the tests. The trouble may be found in the psychotic subject who vacillates and changes from moment to moment though preserving general tendencies like the manic "low" and the depressive "high" perseveration.

The results also make apparent a significant connection between the two sensory tests and a less significant one between the two motor tests and little or practically no connection between the two types of tests (sensory and motor). Perhaps Allport's objection in this connection is pertinent (regarding the sensory tests).[7] "....they are too trivial to tap the developed volitional functions of personality." Though in view of the definition of perseveration (in the broad sense) it does not necessarily have to meet with Allport's qualifications. Perseveration is not necessarily part of the "volitional functions of personality." The tendency to continue an activity can be well understood without bringing in the possible facilitating or inhibiting effects of volition.

The above discussion of facts does not necessarily destroy the value

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[5] See above; Chapter II.

[6] B.J.Shevach, "Studies in Perseveration V11. Experimental Results of Tests for Sensory Perseveration," The Journal of Psychology, 1936, 3, 403-427.

[7] G.W.Allport, Personality, A Psychological Interpretation, 1937.

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The results also make apparent a significant connection between the memory tests and a less significant one between the two motor tests and tests or practically no connection between the two types of tests (memory and motor). Perhaps Allport's objection in this connection is pertinent (regarding the memory tests). "....they are too trivial to tap the deep-seated volitional functions of personality." Though in view of the definition of perseveration (in the broad sense) it does not necessarily seem to meet with Allport's qualifications. Perseveration is not necessarily part of the "volitional functions of personality." The tendency to continue activity can be well understood without bringing in the possible initiation or inhibiting effects of volition.

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[5] See above Chapter II.

[6] J.C.Shevach, "Studies in Perseveration VII. Experimental Results of the Memory Perseveration," The Journal of Psychology, 1936, 3, 103-12?

G.W.Allport, Personality, A Psychological Interpretation, 1937.

of the results obtained and individual differences uncovered in the psychotic groups.

The test on "Rhythmic Perseveration" shows that the subjects who did not change their rhythm at all, are also higher perseverators on the other tests. However, on the basis of this dichotomous classification of perseverators and non-perseverators it is difficult to work out a correlational function. The greater tendency of correspondence with this dichotomy is on part of the motor tests while the results of the sensory tests are equivocal. It must be concluded that this measure of perseveration has great promise; it may best tap the true sources of the perseverative tendency after greater refinement is introduced in the recording apparatus.

C. Relation between Age and Perseveration

In our group comparisons we tried to eliminate the age factor since some of the tests correlate positively with age. The Adaptation experiment results and those of electrical sensitivity and the Z-test correlate positively and quite consistently (preliminary and final results) with age. Granted that some of the correlations are not very significant; (low correlation and high probable error) they indicate a definite tendency nevertheless. On the whole, our results are in agreement with those of Cattell[8] obtained from normal subjects with motor tests only. There is a lower perseveration score in the early twenties than in later years. The low ratios of the differences between the means and the probable errors of those differences (less than 4) may detract from the absolute certainty,

[8] R.B.Cattell, "On the Measurement of 'Perseveration,'" British Journal of Educational Psychology, 1935, 5, 76-92.

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Ostell[5] obtained from normal subjects with motor tests only. There is a
ower perseveration score in the early twenties than in later years. The
ratio of the differences between the means and the probable errors of
hese differences (very than 4) may detract from the absolute certainty.

[5] R.R.Ostell, "On the Measurement of Perseveration," Archives
Journal of Educational Psychology, 1927, 8, 2443.

that a true difference exists. With the exception of the stroke test the tendency for the "p" score to increase with age (until 50) is quite marked. However, we were unable to confirm and must disagree with his conclusion that there is "....a further rise in extreme old age."[9] Of course, it also depends on the definition of "extreme old age." But on the contrary, our results show a slight decrease in the "p" scores when the subjects approach sixty. This objection, however, must be qualified and it must be understood that complications due to psychosis are a factor which cannot be overlooked in the comparison. But, for the sake of truth, it should be stated that the differences between the means in Cattell's work are rather small; also, no measures of significance are given, which robs the work of its conclusiveness.

Another explanatory observation must be made before closing this section. The "lower p" score in motor tests only may be also explained on the basis of a reduction in general speed and fluency with age. Since, to some extent, the "p-score" depends on the initial speed of performance, it is accordingly reduced at the older age.

D. "Improvement" and P-Scores

Stephenson's[10] claims that scores on perseveration tests may serve as a "barometer" of the mental state of the patient, are somewhat exaggerated and unwarranted by the evidence. Our results do show a tendency toward lower "p" scores in the case of improved patients. The degree of improvement of the patients in our results is, however, determined on more objective

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[9] Ibid., 90.
[10] Stephenson, op.cit.

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[9] Ibid., 30.
[10] Stephenson, op.cit.

bases. Also, Stephenson retested patients who improved and based his conclusions on the results obtained from them. This procedure is not quite valid, since the element of training is not taken into consideration. Darroch[11] investigated this point and found that it may be a vitiating factor. Our comparisons are not based on retests. We did not administer the same tests to the same subjects during different stages of recovery. Our results are based on a comparison of scores of groups of subjects tested only once. These groups were differentiated, as stated above, on the basis of the degree of improvement. Hence our results seem to be more reliable.

E. Theoretical Considerations.

On the basis of our results, we cannot agree with most of the investigators who put dementia praecox as highest in regard to perseveration. As we pointed out, there was no sufficient differentiation between the groups within the general group in their investigations.

The results, however, which follow from the work of Stephenson and others, seem to possess theoretical implications which are in keeping with some traditional typological theories. It was mentioned earlier in this paper[13] that Gross identified the low secondary function with the "broad and shallow" type of consciousness while a high secondary function was characteristic of the "deep and narrow" type of consciousness. Jung's Extroversion-introversion is parallel to Gross' types. Jung says[14] that

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[11] J.Darroch, "An Investigation into the Degree of Variation in the Score of a Motor Perseveration Test," British Journal of Psychology, 1938, 28, 248-262.

[12] Ibid., 261.

[13] Gross, op.cit.

[14] C.C.Jung, Psychological Types, 1926.

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11 I. Barron, "An Investigation into the Degree of Vertiction in the Case of a Motor Perseveration Test," British Journal of Psychology, 1936, [illegible]

12 Ibid., 221.

13 Cross, op. cit.

14 Jung, Psychological Types, 1923.

"Introversion is distinguished by....intensive primary function and a correspondingly long secondary function," while "extroversion is characterized by ....weak primary function, and a correspondingly short secondary function." Since dementia praecox is identified with extreme introversion, and manic-depression with extreme extroversion, the two psychotic groups should give, deducing from Jung, high and low perseveration scores, respectively. Our results, as stated above, do not "support this notion." We are opposed to the broad classification, in regard to perseveration, of manic-depressives and dementia praecox. We find that in both classes there are groups of individuals who have either high or low perseveration. This is not due to any "supervening dementia," but to the peculiar state of the individual personality. Jung admits that "exceptions, however, are frequent even in one and the same individual."[15] An introvert may be extroverted under favorable conditions, while an extrovert may turn inward in a hostile, unfriendly situation.

We cannot, then, always speak of the manic-depressive, extrovert constitution, neither can we speak of the dementia praecox, introvert constitution. It appears that the psychiatric condition itself, ultimately, perhaps, traced to psychological extremes of types, creates the new milieu for the individual and guides and changes the secondary function or perseverative tendency along with it.

Thus, the manic, whose milieu is "favorable", is extremely extroverted, while the depressive of, presumably, the same constitution, gets "introverted" as a result of his own unpleasant world. This can also similarly be traced in the dementia praecox cases, who also become extroverted, while

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15 Ibid., 356.

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[15] Ibid., 856.

the catatonics of that group are "true to their classification" as extreme introverts and perseverators.

More caution, then, will have to be exercised in our linking extroversion and introversion with high and low perseveration. The particular, though transient, state of the individual under the experimental conditions must be considered. The emotional tone is an important factor. And, perhaps, more conclusive evidence may substantiate Shevach's[16] statement, that "the subjects must first be divided into those in whom perseveration is a functional unit and those in whom it is highly specific."

We must then, from our work with psychotics, conclude that extremes of extroversion and of introversion go with extremes of low and high secondary function. However, the secondary function is also changeable in correspondence with the changeability of the state of introversion and extroversion.

Returning to Shevach's statement quoted above, we may consider it as a reasonable explanation of the low intercorrelation between our perseveration tests. A number of our individuals may be perseverators "true and consistent," while in others, perseveration does not exist as a functional unit, but is "highly specific" in the various and sundry test-situations.

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[16] B.J.Shevach, "Studies in Perseveration Vll. Experimental Results of Tests for Sensory Perseveration," The Journal of Psychology, 1936, 3, 403-427.

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16 - J. Shevach, "Studies in Perseveration VII. Experimental Results Tests for Sensory Perseveration," "The Journal of Psychology, 1938, 6, 117-127.

CHAPTER VII

CONCLUSIONS

A. Conclusions

In drawing our conclusions we must be cautious to distinguish between actual factual results obtained in experimentation and theoretical superstructures. The mixture of these two elements and the eradication of the line of demarcation between them, may be a very tempting urge. We shall, however, try to avoid these pitfalls and confine ourselves to the following conclusions warranted by the experimental data:

1. Differences between the two general psychiatric categories of dementia praecox and manic-depressive psychoses, with regard to perseveration as measured by our tests, exist, but are not sufficiently significant statistically. The tendency is in the direction of higher perseveration in the manic-depressive group and lower in the dementia praecox group.

2. Differences in degree of perseveration also exist between the sub-groups, within each general psychiatric category:

a. The manics tend to be lower perseverators than are the depressives.

b. The catatonics are the greatest perseverators in the dementia praecox group, while the paranoids tend to be lowest in this group.

c. When all groups are compared together, the manics tend to be the lowest perseverators, while the catatonics possess the highest degree of perseveration.

3. Age differences do exist in perseveration and have introduced a factor of error in previous investigations. Patients in the third decade of life (20-29 group) have a considerably lower perseveration score than the individuals of an older age. There also seems to be a slight tendency for

Conclusions

In drawing our conclusions we must be cautious to distinguish between real factual results obtained in experimentation and theoretical conjectures. The mixture of these two elements and the gradation of the degree of demarcation between them, may be a very tempting urge. We shall, however, try to avoid these pitfalls and confine ourselves to the following conclusions warranted by the experimental data:

1. Differences between the two general reproductive categories of both females and males-depressive reproducers, with respect to preservation as measured by our tests, exist, but are not sufficiently significant statistically. The tendency is in the direction of higher preservation in the manic-depressive group and lower in the dementia praecox group.

2. Differences in degree of preservation also exist between the groups, within each general reproductive category:

a. The manics tend to be lower preservators than are the depressives.

b. The catatonics are the greatest preservators in the dementia praecox group, while the paranoids tend to be lowest in this group.

c. When all groups are compared together, the manics tend to be the least preservators, while the catatonics possess the highest degree of preservation.

3. Age differences do exist in preservation and have introduced a factor of error in previous investigations. Patients in the third decade of life (20-29 group) have a considerably lower preservation score than the individuals of an older age. There also seems to be a slight tendency for

the "p" score to go down after the individual has reached 50 years of age.

4. The tests employed do not seem to give to perseveration the status of functional unity; from our data we are unable to state whether the subjects or the tests were responsible for that.

5. The new test of "rhythmic perseveration" gives some measure of validation of the results of the other tests.

6. The closer proximity of the patient to "normalcy" is also characterized by a lower perseverative tendency.

B. On the Future

We do not claim too much for these results. The contacts of perseveration with psychiatry are numerous and provide a very fertile field for further investigation. Conquest of new frontiers in this respect will be largely conditioned by the perfection of our instrumental and psychometric devices in measuring the perseverative tendency or secondary function. Like many investigators, we attempt to add our bit towards "a complete solution"-yet to be achieved.

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PERSEVERATION IN DEMENTIA PRAECOX AND MANIC DEPRESSIVE PSYCHOSES

by

Israel Rabin

(B.S.in Ed., Boston University, 1935; A.M., Boston University, 1936)

submitted in partial fulfilment of the

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PERSEVERATION IN DEMENTIA PRAECOX AND IN THE MANIC DEPRESSIVE PSYCHOSES.

The phenomenon of perseveration has been recognized long ago and may be traced back to ancient philosophical literature. It is noticeable in every day life, in the uncontrollable persistence of ideas in our minds and in the after effects of previous activities and patterns of behavior upon our present actions. After sensations, after images and the like have also been included under the term perseveration.

It is not an isolated phenomenon since its existence can be explained on the basis of the latest developments in neurophysiology. Automatic and spontaneous discharges and "after-discharges" of nerve cells occupy the position of established facts. This automaticity and after -discharge in the nervous system, after the original stimuli or stimulating situations are removed, is in accordance with the psychologically noted "after-effect;" mental inertia or perseveration.

The word "perseveration" as such was used, by the German psychiatrist, Neisser, for the first time. Since the end of the last century, when the term was introduced, it was employed descriptively in psychiatry. Repetitive movements or words on the part of a mental patient, despite his desire to change his behavioral pattern, were considered to be demonstrations of the perseverative tendency. This repetition, usually, has an original stimulus, but the response could not be checked, while stereotypy, which was for a while considered synonymous with perseveration, is an oft-repeated activity or postural attitude which cannot be traced back to any stimulus. Phenomena of a similar nature were observed by Jung in his association experiments. Certain words have been repeated several times as responses to different stimulus words.

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On the basis of accumulated clinical observations, Gross, in his theoretical treatise, posited two main principles of all mental life---the primary and secondary functions. The primary function was direct perception and thought in any form, while the secondary function was the "after-function" or the process set up after the removal of the original stimulus. According to Gross, individuals who have a longer secondary function tend to follow a narrow, but deep path in their mental life; once a process is set up, it continues for a long time. On the other hand, the shallow and broad type of person has a shorter secondary function; new stimuli take more rapidly the place of previous mental processes, since there seems to be less secondary function or perseveration. Jung's typology of introversion and extroversion follows the same general outline. He linked his types with perseveration in a similar manner.

The Dutch and English Schools set out, in the beginning of the present century, to investigate experimentally, this secondary-function (synonymous with perseveration). They had to devise tests as well as to correlate existing psychological and psychiatric categories with classes discoverable by means of those tests.

The testing methods followed the following general lines:

a. Sensory tests were devised; these tests were to measure the duration of the after-effects of different sense stimulations; i.e., the phenomenon of continuance.

b. Ideational tests which set up a definite response pattern in the subjects; the persistence of this habituated pattern was then measured by the number of responses and by the amount of interference it would show in the following of new instructions; i.e., fluency and interference.

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c. Motor tests in which a certain motor activity was initiated and then changed to a similar one, but not the same; the amount of perseveration being the reduction of the output in the second activity due to the after-effects and the interference of the previous one, i.e., interference.

These tests measured perseveration and, at the same time, operationally defined it; however, the functional unity of the entire group was never definitely established.

Experimental work with mental patients did not yield consistent results. In one case melancholics were considered to be higher perseverators than manics, while in another investigation the results were diametrically opposite. Other investigators have "established" the fact that manics are the lowest perseverators in the psychotic group, while manic-depressives are higher and the dementia praecox cases may be separated into two different groups of high and low perseverators. The factor of age was not investigated in connection with this work. Improvement of Dementia Praecox patients was also shown to affect the perseveration scores in the retests. The factor of training that might render the results erroneous was not taken into consideration.

The undetermined state of affairs in the relationship between psychiatric categories, age and improvement and the degree of perseveration, prompted the present investigation. It was felt that age may play a considerable role in determining the "p" score; it was also thought that high and low "p" in dementia praecox must be explained; the necessity to investigate the relationship between improved patients' perseveration-scores and those of the definitely psychotic ones, revealed itself.

Five tests of perseveration were employed in the present investigation.

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Five tests of perseveration were employed in the present investigation.

Two of the tests were sensory---Adaptation to light and Electrical Threshold Sensitivity; two of the other tests were motor---the Z-tests and the Grouped Strokes tests. The fifth test was devised by the present investigator and was called "A Test of Rhythmic Perseveration." The first four tests were used in various investigations by British and American workers. In the last test the subject performs an activity keeping in time with a slow metronome, the speed of which is suddenly changed, and accordingly, the subject's adjustment time to the new speed is considered to be a measure of perseveration. Some of the subjects demonstrated such a degree of perseveration that their speed remained constant throughout the experiment.

Two groups of patients were used. The preliminary group (A) consisted of thirty-two patients, the second experimental group (B) included eighty patients. All of these subjects belonged to two psychiatric categories---dementia praecox and manic-depressive psychoses. They were all males between the ages of nineteen and sixty.

Part of the experimental procedure was the establishment of a rapport between tester and testee. Modes of response had to be changed for some very depressed patients, while in some cases the results were rendered valueless by lack of full comprehension of the instructions and negativism on the part of certain subjects. Elimination of these results did not introduce unscientific sampling since there was no predominance of a particular diagnosis among the negativistic and unreliable subjects.

The preliminary results showed that the depressive group, which was the younger one, had the higher mean perseveration scores than did the praecox patients. There was also some positive correlation between the

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After the final results were computed, the following conclusions were drawn:

1. The depressive group tends to consist of high perseverators than does the group of dementia-praecox patients.

2. Within the dementia praecox group, catatonics are the highest perseverators while the paranoiacs tend to be lowest.

3. With the exception of one test, the general tendency is to establish the following sequence in order of increasing perseveration: mania, dementia praecox (paranoia, hebephrenia and simple), depression and catatonia.

4. The lowest "p" scores are obtained by the youngest age group (twenty to twenty-nine) while the others (thirty to fifty-nine) are higher perseverators.

5. The sensory tests correlate satisfactorily with each other; a similar relation exists between the motor tests; from the data obtained, however, there is little evidence of a correlation between the sensory and the motor tests.

6. Patients of improved psychiatric condition tend to be lower perseverators.

Further work with the second group of patients (B) seemed to corroborate the preliminary results. The dementai praecox sub-gr investigated more thoroughly and matched so as to eliminate th

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